THE

SILVA OF NORTH AMERICA

A DESCRIPTION OF THE TREES WHICH GROW NATURALLY IN NORTH AMERICA EXCLUSIVE OF MEXICO

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Illustrated with Figures and Analyses drawn from Nature

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VOLUME III.

ANACARDIACEÆ—LEGUMINOSÆ

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To

FRANCIS PARKMAN,

WHOSE WORDS HAVE BEST PAINTED THE BEAUTIES OF

THE AMERICAN FOREST,

HIS FRIEND DEDICATES

This Volume.

SYNOPSIS OF THE ORDERS OF PLANTS CONTAINED IN VOLUME III. OF THE SILVA OF NORTH AMERICA.

CLASS I. **DICOTYLEDONOUS or EXOGENOUS PLANTS.**

Stems increasing in diameter by the annual addition of a layer of wood inside the bark. Leaves netted-veined. Embryo with a pair of opposite cotyledons.

SUB-CLASS I. **Angiospermæ.** Pistil, a closed ovary containing the ovules and developing into the fruit.

DIVISION I. **Polypetalæ.** Flowers with calyx and corolla, the latter divided into separate petals.

B. **DISCIFLORÆ.** Sepals generally distinct. Stamens as many as the petals, or twice as many, or fewer, usually inserted on a hypogynous or perigynous disk. Ovary superior, many-celled.

18. **Anacardiaceæ.** Flowers usually polygamo-diœcious. Disk coherent with the base of the calyx. Sepals and petals imbricated in æstivation. Stamens usually as many as the petals and alternate with them, or twice as many, inserted above or around the disk. Ovary 1-celled, the style 2 or 3-lobed, or 2 to 5-celled. Ovule solitary, suspended from the base of the cell on a slender funicle, or attached to the apex or to a parietal placenta. Seed exalbuminous or rarely albuminous. Leaves alternate or rarely opposite, stipular or exstipular.

C. **CALYCIFLORÆ.** Sepals rarely distinct. Disk adnate to the base of the calyx, rarely tumid or conspicuous or wanting (Mimosæ). Petals usually as many as the lobes of the calyx, or fewer by abortion, inserted on the margin of the calyx-tube or of the disk, occasionally wanting. Stamens definite or indefinite, perigynous or hypogynous. Ovary superior.

19. **Leguminosæ.** Flowers regular or irregular. Stamens definite, monadelphous or diadelphous, or indefinite. Ovary composed of a single carpel. Ovules indefinite or 1 to 2, inserted on the interior angle, amphitropous or anatropous. Style terminal. Albumen often wanting. Leaves usually compound, stipular or exstipular.

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SILVA OF NORTH AMERICA.

COTINUS.

Flowers regular, diœcious by abortion or rarely polygamo-diœcious; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; ovary 1-celled, obovate, compressed; ovule solitary, suspended from the base of the cell. Fruit an oblong oblique compressed drupe. Leaves simple. Abortive pedicels long and tomentose at maturity.

Cotinus, Linnæus, *Gen.* 84. — Adanson, *Fam. Pl.* ii. 345.
Rhus, Linnæus, *Gen.* ed. 5, 129 (in part). — A. L. de Jussieu, *Gen.* 369 (in part). — Endlicher, *Gen.* 1130 (in part). — Meisner, *Gen.* 74 (in part). — Gray, *Gen. Ill.* ii. 157 (in part). — Bentham & Hooker, *Gen.* i. 418 (in part). — Marchand, *Rev. Anacard.* 179 (in part). — Baillon, *Hist. Pl.* v. 321 (in part).

Small trees or shrubs, with scaly bark, stout terete pithy branches, minute acuminate winter-buds, fleshy roots, and strong-smelling resinous juice.[1] Leaves alternate, petiolate, oval, obovate-oblong or nearly orbicular, glabrous or more or less pilose-pubescent, destitute of stipules, deciduous. Flowers minute, greenish yellow, in ample loose terminal or lateral pyramidal or thyrsoidal panicles, the branches from the axils of linear acute or spatulate deciduous bracts. Pedicels slender, accrescent after the flowering period, mostly abortive and then conspicuously tomentose-villose at maturity. Calyx-lobes ovate, lanceolate, obtuse, persistent. Disk fleshy, annular, slightly five-lobed, coherent with the base of the calyx, and surrounding the base of the ovary. Petals oblong, acute, twice as long as the calyx, inserted under the free margin of the disk opposite its lobes, deciduous. Stamens five, inserted under the margin of the disk, alternate with and shorter than the petals; filaments filiform; anthers broadly ovate, attached on the back below the middle, two-celled, the cells opening longitudinally; usually rudimentary or abortive in the pistillate flower. Ovary sessile, obovate; rudimentary in the pistillate flower. Styles three, short and spreading from the lateral apex of the ovary; stigmas large, terminal, obtuse; ovule anatropous, resupinate-suspended from the apex of a long slender funicle rising from the base of the cell; the micropyle superior. Fruit glabrous, conspicuously reticulate-veined, bearing on the side near the middle the remnants of the persistent styles; sarcocarp thin and dry, the endocarp thick and bony. Seed destitute of albumen, amphitropous; testa thin, membranaceous. Embryo filling the seed; cotyledons oval, flat, accumbent; radicle short, incurved towards the hilum, descending by the unequal development of the fruit.

The genus Cotinus occurs in the three continents of the northern hemisphere. The type of the

[1] The juice of the Old World species of Cotinus is said by Cornevin to possess, although in a slighter degree, the irritating properties found in some American species of Rhus. (*Des Plantes Vénéneuses*, 278.)

genus, *Cotinus Cotinus*,[1] a small shrubby tree, is widely distributed through southern Europe, the Orient, Cashmere, the western subtropical Himalayas, and northern China; and a second species very like the first inhabits a few isolated localities in North America.[2]

The heartwood of the Old World Cotinus is orange-colored and often handsomely marked and mottled, and is valued in southern Europe by cabinet-makers; it furnishes a yellow dye, and under the name of Young Mastic or Venetian Sumach was once an article of commercial importance. The bark is aromatic and astringent, and is used as a tonic and febrifuge; and the bark and leaves, which are rich in tannin, are employed in curing leather.[3] In the Himalayas the branches are used in making baskets and as tooth-sticks.[4]

The Venetian Sumach or Smoke-tree, as the Old World species is commonly called, has been cultivated as a garden-plant[5] from early times for the handsome effect produced by the clusters of long brightly colored pedicels; and varieties have appeared with pendulous branches and with deeper colored pedicels than usually occur on the wild plant.

The genus, from Κότινος, the classical name of a tree with red wood, was established by Tournefort,[6] and was afterwards adopted by Linnæus.

[1] *Cotinus Cotinus*, Sargent, *Garden and Forest*, iv. 340.

Rhus Cotinus, Linnæus, *Spec.* 267. — Pallas, *Voyages*, v. 221, t. 10. — Jacquin, *Fl. Austr.* iii. 6, t. 210. — Boissier, *Fl. Orient.* ii. 4. — Hooker f. *Fl. Brit. Ind.* ii. 9. — Hemsley, *Jour. Linn. Soc.* xxiii. 146.

Cotinus Coggygria, Scopoli, *Fl. Carn.* i. 220. — Engler, *De Candolle Monogr. Phaner.* iv. 350.

[2] Traces of Cotinus appear in the recent Eocene flora of Aix, in which Saporta finds the prototypic form of the existing Old World species (Saporta, *Ann. Sci. Nat.* ser. 4. xvii. 278, t. 13, f. 1; *Origine Paléontologique des Arbres*, 299).

[3] Le Maout & Decaisne, *Traité Gen. Bot.* Eng. ed. 363. — Baillon, *Hist. Pl.* v. 300. — Guibourt, *Hist. Drog.* ed. 7, iii. 490. — Aitchison, *Jour. Linn. Soc.* xix. 141.

[4] Brandis, *Forest Fl. Brit. Ind.* 118. — Gamble, *Man. Indian Timbers*, 104.

[5] Pliny, xvi. 18, 30. — Duhamel, *Traité des Arbres*, i. 191, t. 78. — Loudon, *Arb. Brit.* ii. 549, f. 223.

[6] *Inst.* 610, t. 380.

COTINUS AMERICANUS.

Chittam Wood.

PANICLES slender, long-branched, few-flowered. Leaves obovate or oval, puberulous on the lower surface.

Cotinus Americanus, Nuttall, *Sylva*, iii. 1, t. 81. — Sargent, *Garden and Forest*, iv. 340.

Rhus cotinoides, Nuttall in herb. — Cooper, *Smithsonian Rep.* 1858, 250. — Chapman, *Fl.* 70. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*).

Rhus Cotinus (?), Torrey & Gray, *Fl. N. Am.* i. 216.

C. Coggygria, Engler, *De Candolle Monogr. Phaner.* iv. 350 (in part).

A small tree, twenty-five to thirty-five feet in height, with a straight trunk occasionally twelve or fourteen inches in diameter, usually dividing, twelve or fourteen feet from the ground, into several erect stems which separate into wide-spreading, often slightly pendulous branches. The bark of the trunk is an eighth of an inch thick and is light gray and furrowed, the surface breaking into thin oblong scales. The inner bark is white, but on its exposure to the air soon turns orange, and when cut exudes a resinous sap with a strong disagreeable odor. The young shoots are purple at first, but soon become green; during the first winter they are bright red-brown and are covered with small white lenticular spots and marked by large prominent leaf-scars; in their second year the bark of the branches is dark orange-colored. The winter-buds are acuminate and an eighth of an inch long, and are covered with thin dark red-brown scales. The leaves are oval or obovate, rounded or sometimes slightly emarginate at the apex, and gradually contracted at the base; they are thin and membranaceous, entire, with slightly wavy and revolute margins, four to six inches long and two to three inches broad, and are borne on stout petioles varying from a half to three quarters of an inch in length. The leaves are light purple when they unfold and are then covered on the lower surface with fine silky white hairs; they soon turn bright green, and at maturity are dark green above and pale on the lower surface, which is puberulous along the broad midribs and primary veins. The flowers, which appear late in April or early in May, are produced in puberulous terminal panicles five or six inches long and two and a half to three inches broad, the males and females on different individuals. The bracts are scarious, half an inch long, and early deciduous. The flower-bearing pedicels are from a half to three quarters of an inch in length and are usually collected three or four together in loose umbels near the ends of the principal branches of the panicles. The ripe fruit, which is produced very sparingly, is rather more than an eighth of an inch long, and is borne on stalks which vary in length from two to three inches. The sterile pedicels are from one and a half to two inches long at maturity, and are covered with short, not very abundant, and rather inconspicuous pale purple or brown hairs.

Cotinus Americanus was discovered by Thomas Nuttall in 1819 on the banks of Grand River, a tributary of the Arkansas, within the present limits of the Indian Territory;[1] twenty-three years later it was found by Mr. S. B. Buckley[2] in Alabama, where it grows in a few localities north of

[1] *A Journal of Travels into the Arkansas Territory during the Year* 1819, 177.

[2] Samuel Botsford Buckley (1809–1884) was a native of Yates County, New York, and was educated at Wesleyan University, Middletown, Connecticut, where he was graduated in 1836. He established himself as a teacher first in Illinois and then in Alabama, and was one of the earliest naturalists to explore the southwestern regions of the Apalachian-mountain system, where he discovered many interesting plants. In 1866 Buckley was appointed state geologist of Texas, and made his home in Austin, where he resided during the remainder of his life. In Texas he continued his botanical studies and found many undescribed plants. The botanical papers which contained the results of these investigations were prepared without access to a well-equipped library,

the Tennessee River on the southern slopes of the Cumberland Mountains in the neighborhood of Huntsville;[1] it occurs on the Cheat Mountains in eastern Tennessee and in the valley of the Medina River in western Texas.[2] In Alabama *Cotinus Americanus* occupies limestone terraces at elevations of seven hundred to nine hundred feet above the level of the sea, on the steep and rocky slopes of mountains covered with a heavy forest growth of Chestnut Oaks, Elms, Mocker Nuts, Black Maples, and Junipers, and a dense undergrowth composed of the Black Haw, the Wild Plum, the Hornbeam, and the fragrant Sumach. It is nowhere abundant, and occurs only in small isolated groves or thickets scattered along the sides of rocky ravines.

The wood of *Cotinus Americanus* is light, soft, and rather coarse-grained, the layers of annual growth being marked by several rows of large open ducts; it is a bright clear rich orange-color with thin nearly white sapwood, and contains numerous very obscure medullary rays. It is very durable in contact with the soil, but is difficult to season and liable to check in drying. The specific gravity of the absolutely dry wood is 0.6425, a cubic foot weighing 40.04 pounds. It yields a clear orange-colored dye, and was once largely used locally for fence-posts.

Cotinus Americanus was introduced into cultivation through the Arnold Arboretum in 1882. It has not proved hardy in New England, and is not known to have flowered in cultivation. In favorable situations it may be expected to grow to a larger size than the Venetian Sumach. The sterile filaments are shorter, less abundant, and less brightly colored, and it will probably prove a less showy and desirable garden plant.[3]

and brought severe and not always just criticisms upon their author. The last years of his life, devoted principally to farming and fruit-growing, were thus greatly embittered, although his interest in botany survived to the end. *Buckleya*, a remarkable Santalaceous genus, of which he discovered the flowers and fruit, and which is represented in the flora of America by a graceful shrub of the mountains of North Carolina, and in Japan by a second species peculiar to that country, fitly commemorates Buckley's zealous and too little appreciated labors in the cause of science.

[1] The most accessible locality where this tree is found in Alabama is on the slopes and summit of a low hill near Bailey's farm, twelve miles from Huntsville, on the road to Winchester, Tennessee. (Buckley, *Proc. Phil. Acad.* 1881, 125.) It was also found by Mohr on the southern slope of Mt. Sono, east of Huntsville. (*Proc. Phil. Acad.* 1882, 217.) During the War of Secession nearly all the large specimens were cut down for the dye which the wood yields, and the tree is now much less common than formerly and is in danger of extermination.

[2] *Cotinus Americanus* was discovered in Texas on the 6th of June, 1885, by Mr. Julien Reverchon on the steep bluffs of the narrow defile of the Bandera Pass over which the road from Kerrsville to Bandera crosses; and also five miles west of Bandera on the Waresville road. Only a few shrubby individuals were found in these two stations.

[3] The fruiting panicles of the Venetian Sumach as it now appears in gardens have been greatly modified by long cultivation and by selection with a view to developing their showy appearance, and are much more conspicuous than those of the wild plant. Cultivation and selection may be expected to produce similar changes in the American plant.

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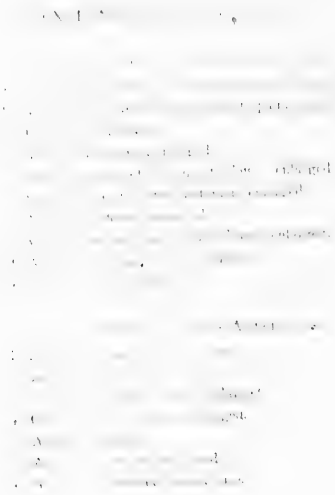
EXPLANATION OF THE PLATES.

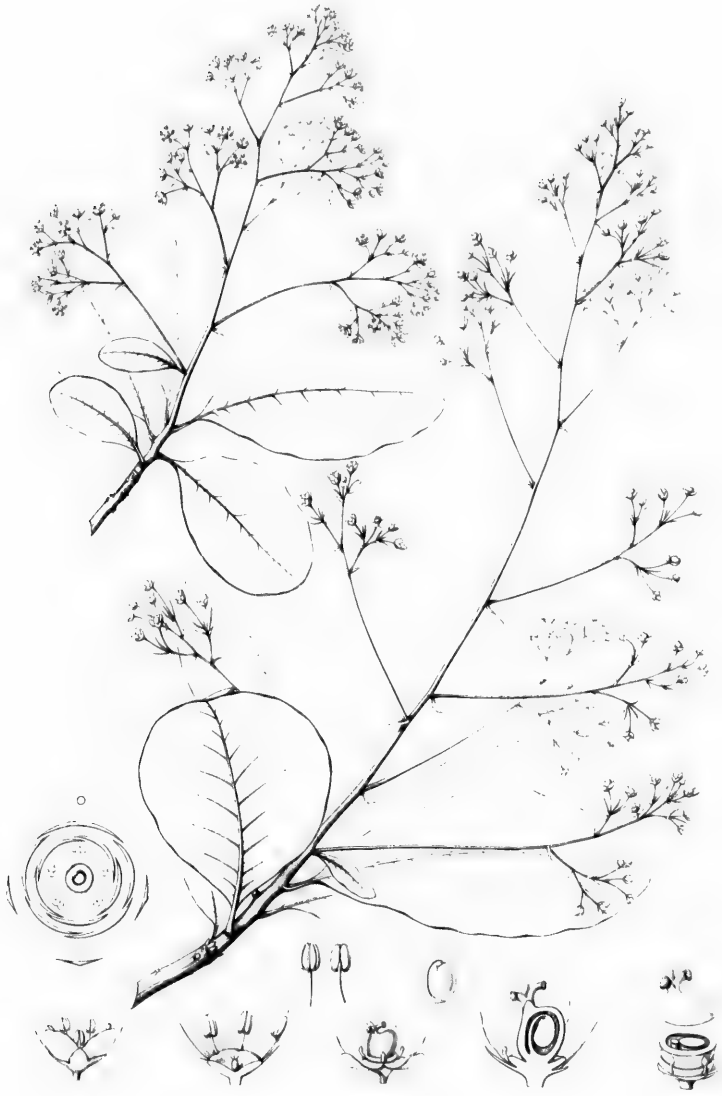
Plate XCVIII Cotinus Americanus.

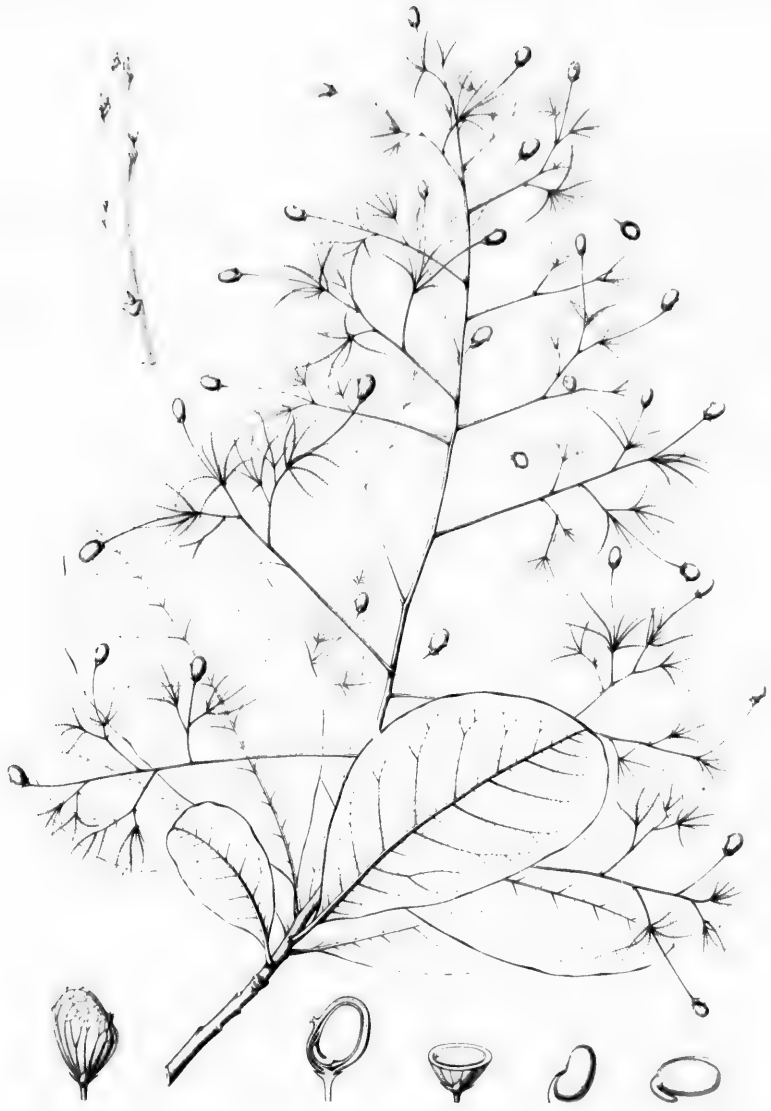
1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. Diagram of a flower.
4. A staminate flower, enlarged.
5. Vertical section of a staminate flower, enlarged.
6. Front and rear view of a stamen, enlarged.
7. A pistillate flower, enlarged.
8. Vertical section of a pistillate flower, enlarged.
9. A pistil cut transversely, enlarged.
10. An ovule, much magnified.

Plate XCIX. Cotinus Americanus.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. Cross section of a fruit, enlarged.
5. A seed, enlarged.
6. An embryo, much magnified.
7. A winter branchlet, natural size.







RHUS.

Flowers regular, polygamo-diœcious, polygamo-monœcious or diœcious by abortion; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; ovary 1-celled, ovoid or globular; ovules solitary, suspended. Fruit, a small nut-like drupe.

Rhus, Linnæus, *Gen.* 84. — Adanson, *Fam. Pl.* ii. 342. — A. L. de Jussieu, *Gen.* 369 (excl. *Cotinus*). — Endlicher, *Gen.* 1130 (excl. *Cotinus*). — Meisner, *Gen.* 74 (excl. *Cotinus*). — Gray, *Gen. Ill.* ii. 157 (excl. *Cotinus*). — Bentham & Hooker, *Gen.* i. 418 (excl. *Cotinus*, *Lithræa*, and *Anaphrenium*). — Marchand, *Rev. Anacard.* 179 (excl. *Cotinus* and *Anaphrenium*). — Baillon, *Hist. Pl.* v. 321 (excl. *Cotinus*, *Lithræa*, and *Anaphrenium*).

Metopium, Browne, *Nat. Hist. Jam.* 177.

Vernix, Adanson, *Fam. Pl.* ii. 342.

Pocophorum, Necker, *Elem. Bot.* ii. 226.

Lobadium, Rafinesque, *Jour. Phys.* lxxxix. 98.

Turpinia, Rafinesque, *N. Y. Med. Rep.* hex. 2, v. 352.

Schmalzia, Desvaux, *Jour. Bot.* iii. 229.

Styphonia, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 220.

Melanococca, Blume, *Mus. Lugd. Bat.* i. 236.

Trees or shrubs, sometimes climbing by rootlets, with stout terete pithy branchlets, fleshy roots, and resinous or viscid milky, sometimes caustic, juice. Leaves alternate, pinnate, pinnately trifoliate or rarely simple, destitute of stipules. Flowers minute, white or greenish white, in more or less compound axillary or terminal panicles, the males and females usually produced on separate plants. Calyx five-lobed, the lobes united at the base only, generally persistent. Disk fleshy, surrounding the base of the free ovary, coherent with the base of the calyx, annular or five-lobed. Petals five, longer than and alternate with the divisions of the calyx, inserted under the margin of the disk opposite its lobes, deciduous. Stamens five, inserted on the margin of the disk, alternate with the petals; filaments subulate; anthers oblong, attached on the back, introrse, two-celled, the cells opening longitudinally; rudimentary or abortive in the pistillate flower. Ovary one-celled, sessile, ovoid or subglobose; rudimentary in the staminate flower; styles three, terminal, free or slightly connate at the base, rising from the centre of the ovary and crowned with the obtuse or capitate stigmas; ovule solitary, anatropous, suspended from the incurved apex of a slender funiculus rising from the base of the cell; the micropyle superior. Fruit usually globose, rarely compressed or ovoid, smooth or covered with hairs; sarcocarp thin and dry, more or less resinous; endocarp crustaceous or bony. Seed ovoid or reniform, amphitropous, commonly transverse, filling the cavity of the fruit, destitute of albumen; testa thin, membranaceous. Embryo filling the seed; cotyledons flat, foliaceous, generally transverse; radicle long, uncinate, laterally accumbent.

Rhus is widely distributed in the extratropical regions of the northern and southern hemispheres, but is rare within the tropics. More than a hundred species are distinguished;[1] they abound in southern Africa,[2] North America, and eastern and southern Asia,[3] and are found in tropical and subtropical America[4] and the Andes,[5] in east tropical Africa,[6] in the Indian Archipelago,[7] the Fejee[8] and Hawaiian Islands,[9] and in Australia[10] where one species is known. Traces of Rhus are rare and

[1] Engler, *De Candolle Monogr. Phaner.* iv. 371.

[2] Harvey & Sonder, *Fl. Cap.* i. 504.

[3] Franchet & Savatier, *Enum. Pl. Jap.* i. 92. — Hemsley, *Jour. Linn. Soc.* xxiii. 146. — Hooker f. *Fl. Brit. Ind.* ii. 9.

[4] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vii. 8, t. 602–604. — Grisebach, *Fl. Brit. W. Ind.* 175. — Triana & Planchon, *Ann. Sci. Nat.* ser. 5, xiv. 288. — Hemsley, *Bot. Biol. Am. Cent.* i. 217.

[5] Ruiz & Pavon, *Fl. Peruv.* iii. 29, t. 252. — Engler, *l. c.* 400.

[6] Richard, *Fl. Abyss.* i. 143. — Oliver, *Fl. Trop. Afr.* i. 436. — Engler, *l. c.* 441.

[7] Blume, *Bijdr. Fl. Ned. Ind.* 1164. — Miquel, *Fl. Ind. Bat.* i. pt. ii. 621. — Engler, *l. c.* 450.

[8] Gray, *Bot. Wilkes Explor. Exped.* 367, t. 44.

[9] Hillebrand, *Fl. Haw. Is.* 89.

[10] Bentham, *Fl. Austral.* i. 488.

faintly characterized in the records of the Tertiary Arctic flora; they abound, however, in that of Europe, especially from the late Eocene to the end of the Miocene period.[1] In North America the genus is widely and generally distributed from Canada to southern Mexico, and from the shores of the Atlantic to those of the Pacific Ocean, with sixteen or seventeen species within the territory of the United States. Five species growing north of Mexico reach the size and attain the habit of small trees; the others are large or small shrubs.

Many species of Rhus possess useful properties, and some of them are of commercial importance. The most valuable is the Lacquer-tree of China and Japan, *Rhus vernicifera*.[2] The acrid milky poisonous juice[3] of this species furnishes the black varnish used by the Japanese in the manufacture of lacquer;[4] and a wax is obtained from the fruit and from that of *Rhus succedanea*,[5] a native of

[1] Saporta, *Origine Paléontologique des Arbres*, 208.

[2] De Candolle, *Prodr.* ii. 68. — Franchet & Savatier, *Enum. Pl. Jap.* i. 93. — Engler, *De Candolle Monogr. Phaner.* iv. 398. — Hemsley, *Jour. Linn. Soc.* xxiii. 148.

R. Vernix, Thunberg, *Fl. Jap.* 121 (not Linnæus).

[3] *Arbor vernicifera legitima, folio pinnato Juglandis, fructu racemoso ciceris facie*, Kaempfer, *Amœn.* 791, t. Kaempfer alludes to the poisonous properties of the juices of this plant in the following passage: "Utrinque Japonica & Siamensis Vernix venenatum exspirat halitum, ex quo labia tumescunt, & caput dolet; unde in deliniendo artifices strophiolo os & nares obligant." 794.

[4] The manufacture of lacquer-ware has been practiced in Japan for more than two thousand years. The principal ingredient used is the sap of the Lacquer-tree, which is cultivated with more or less care all over the main island of Nippon and is grown in several districts of the islands of Kiushiu and Shikoku, although a temperate climate appears to suit it best, as it reaches its greatest perfection on the main island north of latitude 36°. It is cultivated principally in northern Hondo, between latitude 37° and 39°; but extensive plantations occur also in the valley of the Tadami-gawa and in northern Echigo. Here villages are embowered in groves of Lacquer-trees, which grow up with straight trunks and while young produce handsome heads of large pinnate leaves, said by Rein to exceed those of all other species of Rhus in size and beauty. Old trees produce comparatively few branches, and their foliage is light and thin.

The Lacquer-tree is propagated from seed and by cuttings. The fruit is gathered in October, and the outer covering of the stones is at once removed by pounding them in mortars. They are then washed and put into straw sacks, which are plunged in liquid manure or in water during the winter. In the early spring, having been first exposed to the sun for five or six days, they are sown in carefully prepared seed-beds, and covered with a thin layer of soil. The seedling plants reach a height of ten or twelve inches during the first summer, and the following spring are transplanted six feet apart and allowed to grow undisturbed. In ten years they attain an average height of nine or ten feet, with trunks two or three inches in diameter. Plants raised from root-cuttings grow rather more rapidly than seedlings, although the latter make hardier and longer-lived trees. The process is simple and demands little labor or skill. Pieces of the root about half an inch thick are taken from vigorous young trees and are cut into six-inch lengths; these are set in beds in a slanting position, about an inch only being left above the surface of the soil. These cuttings, which are usually planted in March, produce shoots nearly two feet long during the first season, and the following spring are transplanted in the same manner as the seedlings. Once planted, the trees receive little subsequent care, although they repay the cost of occasional manuring by a more luxuriant growth. The increased demand for cereals and other farm produce which has sprung up in Japan of late years has restricted the planting of the Lacquer-tree to hilly and waste grounds, and old plantations bordering arable fields are being destroyed to make room for more valuable crops.

The age at which the trees are tapped varies in different provinces. Sometimes they are tapped when only four years old, although nearly all cultivated trees are allowed to grow for at least ten years before the sap is drawn from them, when they yield from two to three ounces each. Very old trees are supposed to produce the best and strongest lacquer, and the sap from such trees is therefore collected separately and brings a high price.

The operation of drawing the sap from the trees lasts from June until November. A number of short horizontal incisions, one above the other and about six inches apart, are made in the trunk and main branches. From these the sap is collected several times a day with a wooden tool made for the purpose, while every three or four days a sharp knife-blade is run under the bark, along the edges of the cuts, to insure a free flow. Finally all the branches are cut off the tree, and the larger ones are tapped again to extract any sap that may still remain in them, while the small ones which have not been tapped are tied in bundles and steeped in water for several days, when they yield a small amount of sap.

This operation kills the tree in one season. By reducing the number of incisions it is sometimes allowed to live through another season; but the sap then obtained is of inferior quality and trees are rarely worked more than one year. Usually contractors purchase the trees by the thousand, and the sap is extracted as rapidly and as thoroughly as possible by professional tappers. As soon as it is drawn it is poured into large wooden tubs or vats, and is stirred in the sun with large wooden spatulas until all excess of water is evaporated. In some cases it undergoes careful straining; in others it is mixed with sulphate of iron, oxide of iron, or with indigo. A skillful workman is expected to work on an average a thousand trees in a season; and some idea of the extent of the industry may be obtained from the fact that the Province of Echizen sends out fifteen hundred tappers every year to the different lacquer districts of the Empire. From 30,000 to 35,000 tubs of lacquer varnish, each of four gallons capacity, are annually produced in the country. (See J. J. Quin, *Trans. Asiatic Soc. Jap.* ix. pt. i. 1; British Consular Reports, 1882. — Audsley, *Ornamental Arts of Japan*, i. sec. 4, 3. — Louis Gonse, *L'Art Japonais*, 246. — Maeda, *La Revue Scientifique*, ser. 2, xiv. 1178. — Reed, *Japan, its History, Traditions, and Religions*, ii. 31. — Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 186. — Hosie, *Three Years in Western China*, 164.)

[5] The vegetable-wax of Japan is obtained from the thick white coating of the seeds of *Rhus vernicifera* and of *Rhus succedanea*.

southern and eastern Asia. Chinese galls[1] are produced on *Rhus semialata*, a tree widely distributed from the Himalayas through China and Japan to the Hawaiian Islands. *Rhus Coriaria*[2] is cultivated in southern Europe for the tannin contained in its leaves, which, dried and pulverized, are used in curing leather;[3] the acid and astringent fruit was employed by the ancients as a condiment, and is still occasionally used.[4] The wood of many of the species is soft, coarse-grained, and highly colored; others yield hard and heavy wood valued in cabinet-making and for wagons. The acrid and astringent berries of *Rhus glabra*,[5] a shrubby North American species, are diuretic and refrigerant, and are sometimes used, in infusion, in the treatment of catarrhal troubles and in febrile diseases; and an infusion of the leaves and of the inner bark of the roots is employed for the same purpose and in dressing wounds.[6] The leaves of the so-called Poison Ivy of North America and Japan, *Rhus Toxicodendron*,[7] are stimulant and narcotic and are said to have been successfully used in the treatment

This tree is widely distributed in several forms from the Himalayas to Java and Japan, and is extensively grown in the milder portions of Japan, flourishing south of latitude 35° north, and in Kiushiu: and some parts of Inuo, forming a conspicuous feature of the landscape, covering hillsides and lining the borders of fields and roads and the margins of dikes and canals. It is a smaller and more widely branching tree than *Rhus vernicifera*, with smaller leaves but larger, heavier fruit richer in fat; it resembles an Apple-tree in habit, and grows to a height of fifteen or eighteen feet. As the Wax-tree is cultivated for its fruit alone, it is usually propagated from cuttings in order to secure a preponderance of female plants, the methods adopted for multiplying the Lacquer-tree being used. It increases in productiveness with age, and the ground is therefore generally more carefully prepared and enriched for it than for the Lacquer-trees, which are constantly destroyed and replanted.

The fruit of both these trees is kidney-shaped and light yellow-green when ripe. The semitranslucent outer coat separates and falls soon after the fruit reaches maturity, leaving the greenish white fat of the mesocarp visible. As soon as it is gathered the fruit is separated from the stalks and is ground; the meal is then put into hempen sacks, heated by steam, and pressed in wedge-shaped presses. The tallow as it flows from the press soon congeals into a solid mass. This is melted in iron kettles to free it from impurities, and the wax as it rises is skimmed off into small earthenware saucers, from which it can be easily removed in cakes ready for the market. The wax intended for export is made almost entirely from the fruit of *R. succedanea* and undergoes a process of bleaching. The raw wax is melted and allowed to drop through woolen bags into cold water; it is then placed in shallow boxes and exposed to the sun, and, being frequently sprinkled with water and turned, in thirty days becomes white and almost odorless. Rhus-tallow, which is not a true wax, is composed of a mixture of several glycerides, principally of palmitic acid. The Japanese use it for candles and in the place of beeswax in polishing furniture. It is exported in considerable quantities, principally to Great Britain and the United States, and is mixed with beeswax or used as a substitute for it. (See A. Mayer, *Archiv. de Pharmacie*, xii. 2, 1879. — Buri, *Archiv. de Pharmacie*, xii. 5. — Rein, *l. c.* 189.)

[1] Chinese galls are vesicular excrescences produced on the branches and leaf-stalks of *Rhus semialata* (Murray, *Goett. Verh.* 1784, 27, t. 3. — De Candolle, *Prodr.* ii. 67. — Hooker f. *Fl. Brit. Ind.* ii. 10. — Brandis, *Forest Fl. Brit. Ind.* 119. — Franchet & Savatier, *Enum. Pl. Jap.* i. 92. — Engler, *De Candolle Monogr. Phaner.* iv. 380. — Hillebrand, *Fl. Haw. Is.* 89. — Hemsley, *Jour. Linn. Soc.* xxiii. 146) by the punctures of an insect believed to be *Aphis Chinensis*. The galls are light and hollow and vary in length from one to two and a half inches; they contain about seventy per cent. of tannic acid, which is regarded identical with that obtained from oak galls. Chinese galls appear to have been first imported into Europe early in the eighteenth century, when they were known as "Oreilles des Indes" (Geoffrey, *Mém. Acad. Royale des Sciences*, 1724, 324), but they soon disappeared from commerce, and it is only in recent years that they have formed a regular article of trade, being imported from both China and Japan into Europe, where they are used, principally in Germany, in the manufacture of tannic and gallic acids. (Flückiger & Hanbury, *Pharmacographia*, 538.)

[2] Linnæus, *Spec.* 265. — De Candolle, *Prodr.* ii. 67. — Sibthorp, *Fl. Græc.* iii. 84, t. 290. — Ledebour, *Fl. Ross.* i. 509. — Boissier, *Fl. Orient.* ii. 4. — Engler, *De Candolle Monogr. Phaner.* iv. 381.

[3] *Rhus Coriaria*, which is a small shrubby tree, grows naturally on dry rocky slopes and on gravelly sterile plains, and is widely distributed through the regions bordering the Mediterranean and the Black Sea, extending into the Caucasus, to the shores of the Caspian and to northern Persia, and to Madeira and the Canary Islands.

The sumach of commerce, used in curing the best qualities of leather, consists of the dried and powdered leaves of this plant, which has long been cultivated on a large scale in southern Europe, particularly in Italy, Spain, and Portugal. Dry calcareous soil from which the water drains rapidly produces the most valuable sumach. The plants are propagated by suckers, which are set in December and January and yield a harvest of leaves the first year. They are carefully cultivated and are severely pruned at the beginning of winter to encourage the production of vigorous shoots and a large crop of leaves. A plantation is usually profitable for twelve or fifteen years, and is then dug up and renewed. The leaves are gathered in June, and are threshed and ground into fine powder, in which form sumach appears in commerce. It is bright olive-green and contains from twenty-five to thirty per cent. of tannic acid identical with that found in Oak galls. (For a detailed account of the method of cultivating *Rhus Coriaria* in Sicily, see a paper by Professor Inzenga in the *Annali di Agricultura Siciliana*, 1852, reproduced in the *Trans. Bot. Soc. Edinburgh*, ix. 341. See also *U. S. Consular Reports*, No. 42, June, 1884, 27. — Naudin, *Manuel de l'Acclimateur*, 462.)

[4] A. de Candolle, *L'Origine des Plantes Cultivées*, 106.

[5] Linnæus, *Spec.* 265. — Engler, *De Candolle Monogr. Phaner.* iv. 376. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

[6] Stillé & Maisch, *Nat. Dispens.* ed. 2, 1230. — *U. S. Dispens.* ed. 14, 772. — Parke, Davis & Co., *Organic Mat. Med.* 174.

[7] Linnæus, *Spec.* 266. — Engler, *l. c.* 393. — Watson & Coulter, *l. c.*

of cutaneous diseases. Their medicinal worth, however, is not great.[1] The juice of this plant, which turns black on exposure to the air, may serve as indelible ink; it is soluble in ether.[2] An infusion of the astringent bark of the roots of *Rhus aromatica*,[3] an undershrub widely distributed through the northern states and Canada, is valued as an excitant to the bladder, and in the treatment of hemorrhages and of atonic diarrhœa.[4] The white waxy exudation produced in summer from the fruit of *Rhus ovovata*,[5] a shrubby species of the mountains of southern California and the adjacent regions of Mexico, has a sweet and agreeable flavor, and is used by Indians as a substitute for sugar.[6]

Few species of insects[7] are known to injure Rhus in North America; and its diseases caused by fungi[8] are not numerous or particularly serious.

Several species of Rhus, particularly the Sumachs of eastern North America, have long been grown in gardens for the beauty of their fruit and of their foliage which assumes brilliant colors in autumn. The Asiatic *Rhus semialata* is cultivated in the gardens of the United States and Europe for its conspicuous flower-clusters and its large handsome leaves which turn orange and scarlet before falling. *Rhus lucida*,[9] a native of southern Africa, is often employed as a hedge plant in the countries adjacent to the Mediterranean.[10]

The name of the genus, formed from Ῥοῦς, the classical name of the European Sumach, was established by Tournefort[11] and afterwards adopted by Linnæus.

[1] Stillé & Maisch, *Nat. Dispens.* ed. 2, 1436. — *U. S. Dispens.* ed. 14, 906.

[2] The juices of *Rhus Toxicodendron*, and even the effluvium exhaled by it under the influence of a hot sun, are extremely poisonous to some persons, while others are not affected by them and can handle the plant without injury. The effects of the poison, which appear several hours after exposure, are redness and violent itching, followed by fever and a vesicular eruption which may be accompanied, especially on the face and genitals, with tumefaction; they reach their height on the fourth or fifth day, when desquamation begins and the swelling and pain subside. Herbivorous animals are particularly fond of the leaves of *R. Toxicodendron* and devour them greedily and with perfect impunity; and various insects which feed upon them do so, apparently, without injury. (J. C. White, *Dermatitis Venenata*, 31.)

[3] Aiton, *Hort. Kew.* i. 367. — Gray, *Gen. Ill.* ii. 160, t. 160; *Man.* ed. 5, 112.

R. Canadensis, Marshall, *Arbust. Am.* 129. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

[4] Napheys, *Medical Therapeutics*, 467. — Parke, Davis & Co., *Organic Mat. Med.* 154.

[5] Watson, *Proc. Am. Acad.* xx. 358.

Styphonia integrifolia, Torrey, *Pacific R. R. Rep.* vii. pt. iii. 9, t. 2 (in part).

R. integrifolia, Brewer & Watson, *Bot. Cal.* i. 110 (in part).

[6] C. R. Orcutt, *The Western American Scientist*, iii. 46.

[7] The Jumping Sumach-beetle (*Blepharida rhois*, Forster) is one of the most troublesome insects which attack Rhus in North America, often defoliating *R. glabra* and *R. typhina* over large areas of country. (C. V. Riley, *6th Rep. Insects of Mo.* 118.) Caterpillars of various species feed on the leaves, and a leaf-roller (*Lozotœnia rosaceana*, Harris) frequently disfigures them. An aphis (*Pemphigus rhois*, Fitch) causes the large conspicuous galls which often appear on the leaves of *R. typhina*, and *Psylla rhois*, Fitch, is sometimes found in great numbers on the different species, especially on *R. copallina*.

[8] Most of the fungi inhabiting Rhus in North America are small species of the order *Discomycetes* found on the stems and less frequently on the leaves. The most conspicuous of these in the northern and eastern parts of the country is *Taphrina purpurascens*, Robinson; it is most abundant on *Rhus copallina*, but also attacks *R. glabra*. The diseased leaves, which are principally near the tips of the branches, may at once be recognized by a dark lurid purple color becoming somewhat glaucous as the spores ripen. The affected leaflets are abnormally swollen and crisp on the upper surface, and finally hang drooping from the branches. The effect produced by this fungus is very unsightly, and might, without the aid of a microscope, pass for the work of insects. *Uromyces brevipes* (B. & Rav.) is found throughout the eastern and central parts of the United States on *R. Toxicodendron* and occurs in California on *R. diversiloba*. *Pileolaria effusa* (Peck), a closely related species, is found on *R. aromatica*, and other related forms afflict different species of Rhus in Japan.

[9] Linnæus, *Spec.* 267. — Cavanilles, *Icon.* ii. 27, t. 132. — Harvey & Sonde., *Fl. Cap.* i. 517. — Engler, *De Candolle Monogr. Phaner.* iv. 413.

[10] Naudin, *Manuel de l'Acclimateur*, 463.

[11] *Inst.* 611, t. 381.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

METOPIUM. Flowers in axillary panicles; drupe obovate, glabrous; leaves unequally pinnate. (Poisonous.)

Leaves pinnate or often trifoliate . . . . . 1. R. METOPIUM.

SUMAC. Flowers in terminal thyrsoidal panicles; fruit globular, clothed with acrid hairs; leaves unequally pinnate.

Branches and leaf-stalks densely velvety-hairy; leaflets 11 to 31, pale on the lower surface; fruit covered with long hairs . . . . . 2. R. TYPHINA.

Branches and leaf-stalks pubescent; petioles winged; leaflets 9 to 21, green on the lower surface; fruit pilose . . . . . 3. R. COPALLINA.

TOXICODENDRON. Flowers in slender axillary panicles; fruit glabrous, white; leaves unequally pinnate or trifoliate. (Poisonous.)

Leaves pinnate, seven to thirteen-foliolate . . . . . 4. R. VERNIX.

STYPHONIA. Flowers in terminal panicles; pedicels conspicuously bracted; fruit pubescent; leaves usually simple, persistent.

Flowers in short compact panicled racemes; leaves ovate, entire or serrate, simple or rarely trifoliate . . . . . 5. R. INTEGRIFOLIA.

RHUS METOPIUM.

Poison Wood. Hog Gum.

FLOWERS diœcious by abortion. Drupe obovate, glabrous; stone chartaceous. Leaves unequally pinnate; leaflets glabrous, entire.

Rhus Metopium, Linnæus, *Amœn.* v. 395. — Poiret, *Lam. Dict.* vii. 507. — Titford, *Hort. Bot. Am.* 51. — Descourtilz, *Fl. Med. Antil.* ii. 49, t. 79. — Roemer & Schultes, *Syst.* vi. 648. — De Candolle, *Prodr.* ii. 67. — Don, *Gen. Syst.* ii. 69. — Spach, *Hist. Vég.* ii. 211. — Macfadyen, *Fl. Jam.* 225. — Dietrich, *Syn.* ii. 1002. — Nuttall, *Sylva*, ii. 121, t. 80. — Richard, *Fl. Cub.* ii. 157. — Grisebach, *Fl. Brit. W. Ind.* 175. — Chapman, *Fl.* 69. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 54.

R. Oxymetopium, Grisebach, *Cat. Pl. Cub.* 67.

Metopium Linnæi, Engler, *De Candolle Monogr. Phaner.* iv. 367.

Metopium Linnæi, var. **Oxymetopium**, Engler, *De Candolle Monogr. Phaner.* iv. 367.

A tree, with exceedingly acrid poisonous juices, frequently thirty-five to forty feet in height, with a short trunk sometimes two feet in diameter, and stout spreading often pendulous branches forming a low broad top. The bark of the trunk is an eighth of an inch thick, and separates into large thin plate-like scales displaying the bright orange-color of the inner bark; it is light reddish brown tinged with orange and often marked with dark spots caused by the exuding of the resinous gum with which this tree abounds. The branchlets are thick and are reddish brown, with prominent leaf-scars and numerous orange-colored lenticular excrescences. The winter-buds are large and covered with thick acuminate scales truncate at the apex and furnished on the margin with rufous hairs. The leaves, which are clustered near the ends of the branches, are nine to ten inches long, and are borne on stout petioles with swollen and enlarged bases; they are composed of two or three pairs and a terminal leaflet, or are often three-foliate, and unfold in March, remaining on the branches until the appearance of the new growth the following year. The leaflets are ovate, broadly rounded or usually contracted towards the apex, which is then acute or sometimes slightly emarginate, and rounded or sometimes cordate or wedge-shaped at the base. They are thick, smooth, and lustrous, with thickened slightly revolute margins, prominent midribs, primary veins spreading at right angles, and many reticulating veinlets; they are three or four inches long and two or three inches broad, and are borne on stout petiolules half an inch or an inch in length, that of the terminal leaflet being sometimes twice as long as the others. The male and female flowers are produced on separate trees in slender erect axillary clusters aggregated at the ends of the branches and as long as the leaves or rather longer. The stem of the inflorescence is enlarged at the base, and, like its branches, is covered with small orange-colored lenticular spots. The bracts and bractlets are acute, minute, and deciduous. The pedicels are stout, an eighth of an inch thick, and as long as the obtuse flower-buds. The lobes of the calyx are semiorbicular, with membranaceous margins, and are half the length of the ovate obtuse yellow-green petals, which are marked on the inner surface with dark longitudinal lines. The stamens are rather shorter than the petals in the sterile flower, and are minute and rudimentary in the fertile flower. The ovary, which in the sterile flower is reduced to a small point, is subglobose with a short style and a large three-lobed stigma. The fruit ripens in November and December, and hangs in long graceful clusters; it is obovoid, orange-colored, glabrous and rather lustrous, three quarters of an inch in length, and crowned with the remnants of the style. The outer covering, which is rather thick and resinous, incloses a thin crustaceous stone and a nearly quadrangular thin seed with a broad funicle covering its margin and a smooth dark brown opaque testa.[1]

[1] The juices of *Rhus Metopium*, and even its exhalations at the time the trees are in flower, are exceedingly poisonous to most people, producing the same symptoms as those caused by *Rhus Toxicodendron*.

Rhus Metopium is found in Florida on the shores of Bay Biscayne and on the principal southern keys, where it is one of the commonest and most beautiful of the smaller trees. It also inhabits the Bahamas, Cuba, Jamaica, and Honduras.

The wood of *Rhus Metopium* is heavy and hard, although not strong, and contains many evenly distributed open ducts and thin medullary rays. It is rich dark brown streaked with red, with thick light brown or yellow sapwood composed of twenty-five to thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.7917, a cubic foot weighing 49.34 pounds. It checks badly in drying and is little used or esteemed. An emetic, purgative, and diuretic resinous gum is obtained from incisions made in the bark.[1]

Rhus Metopium was probably first described by Sloane[2] in his catalogue of the plants of Jamaica published in 1696. It was first discovered in Florida[3] by Dr. J. L. Blodgett.[4]

Metopium, the name used by Pliny[5] for an African tree, was first adopted by Browne as the generic name of this plant.

[1] *Pharmaceutical Journal*, v. 60; vii. 270. — Guibourt, *Hist. Drog.* ed. 7, iii. 489. This resin appears to have been formerly held in some esteem by the inhabitants of Jamaica, where, according to Browne, it was much employed in "strengthening plasters" and was useful in the treatment of "all swellings arising from colds, the weakness of the vessels, or poverty of the juices, both externally and internally." (*Nat. Hist. Jam.* 178.)

[2] *Terebinthus maxima, pinnis pauciioribus majoribus atque rotundioribus, fructu racemoso sparso*, 167; *Nat. Hist. Jam.* ii. 90, t. 199.

Toxicodendron foliis alatis fructu purpureo Pyri formi sparso, Catesby, *Nat. Hist. Car.* i. 40, t. 40.

Metopium foliis subrotundis, pinnato-quinatis, racemis alaribus, Browne, *Nat. Hist. Jam.* 177, t. 13, f. 3.

It is possible that the "Poyson Tree," which Richard Ligon could not commend for her virtues, although he could for her beauties, may have been *Rhus Metopium*, although it is not reported as now growing on the Barbadoes. (See *A true and exact History of the Island of Barbados*, by Richard Ligon, Gent., London, 1657, p. 68.)

Samuel Clarke, in *A True and Faithful Account of the Four Chiefest Plantations of the English in America, to wit, of Virginia, New England, Bermudas and Barbados*, published in London in 1670, describes on page 72 a Poison Tree, which is, perhaps, *Rhus Metopium*. This, he says, "is very beautiful, almost as large as the Locust: Her *Leaves* as large and beautiful as *Laurel Leaves*, and very like them. As they cut down these *Trees* they have *Cipers* over their *Faces:* For if any of their Sap flies into their eyes, it makes them blind for a moneth after. Of this Timber they make most of the Vessels wherein they cure their Sugar."

[3] *Rhus Metopium* is called by the inhabitants of the Florida keys Coral Sumach, Mountain Manchineel, Bum Wood, and Doctor Gum, as well as, more commonly, Poison Wood and Hog Gum. This last name, by which the tree was known in Jamaica in Sloane's time, had its origin, he says, in the fact "that wild Hogs, when wounded, by natural Instinct come to this Tree, where by rubbing its Balsam on their Wounds they are cured." (*Nat. Hist. Jam.* ii. 91.) According to Macfadyen, however, the true Hog Gum-tree is *Moronobea coccinea*, Aubley, and not Rhus. (*Fl. Jam.* 225.)

[4] See i. 33.

[5] xii. 23, 49.

EXPLANATION OF THE PLATES.

Plate C. Rhus Metopium.

1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. Diagram of a flower.

Plate CI. Rhus Metopium.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. Cross section of a fruit, enlarged.
4. A seed, enlarged.
5. An embryo, magnified.

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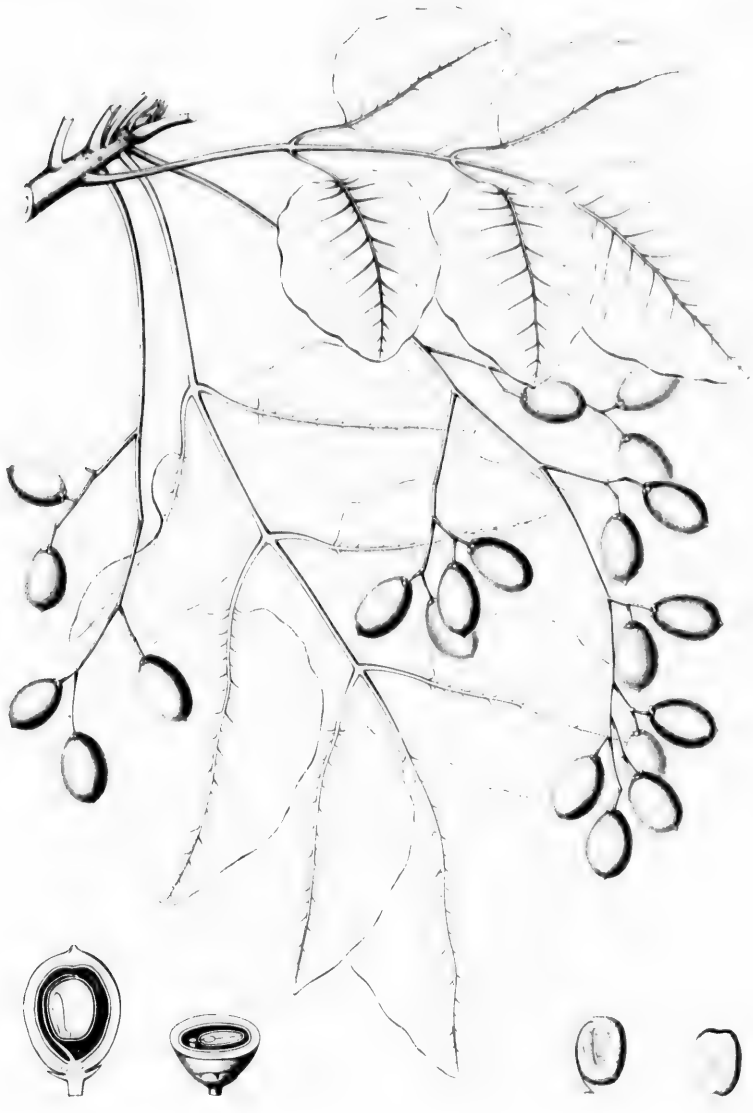


RHUS TYPHINA.

Staghorn Sumach.

Branches and leaf-stalks densely velvety-hairy. Leaflets 11 to 31, pale on the lower surface. Fruit covered with long hairs.

Rhus typhina, Linnæus, *Amœn.* iv. 311. — Miller, *Dict.* ed. 8, No. 2. — Medicus, *Bot. Beob.* 1782, 228. — Wangenheim, *Nordam. Holz.* 95. — Marshall, *Arbust. Am.* 129. — Walter, *Fl. Car.* 255. — Ehrhart, *Beitr.* vi. 89. — Castiglioni, *Viag. negli Stati Uniti,* ii. 355. — Moench, *Meth.* 72. — Willdenow, *Spec.* i. 1478; *Enum.* 323. — Schoellenbach, *Abbild. Bäume,* ii. 77, t. 46. — Schkuhr, *Handb.* i. 239. — Michaux, *Fl. Bor.-Am.* i. 182. — *Nouveau Duhamel,* ii. 164. t. 47. — Persoon, *Syn.* i. 324. — Desfontaines, *Hist. Arb.* ii. 325. — Poiret, *Lam. Dict.* vii. 503. — Pursh, *Fl. Am. Sept.* i. 204. — Bigelow, *Fl. Boston.* 72. — Nuttall, *Gen.* i. 203. — Roemer & Schultes, *Syst.* vi. 643. — Hayne, *Dendr. Fl.* 33. — Elliott, *Sk.* i. 360. — Torrey, *Fl. N. Y.* i. 128. — De Candolle, *Prodr.* ii. 67. — Sprengel, *Syst.* i. 936. — Watson, *Dendr. Brit.* i. t. 17, 18. — Hooker, *Fl. Bor.-Am.* i. 126. — Don, *Gen. Syst.* ii. 70. — Spach, *Hist. Vég.* ii. 212. — Bennett, *Pl. Jav. Rar.* 80. — Torrey & Gray, *Fl. N. Am.* i. 217, 680. — Dietrich, *Syn.* ii. 1002. — Emerson, *Trees Mass.* ed. 2, ii. 571, t. — Darlington, *Fl. Cestr.* ed. 3, 43. — Chapman, *Fl.* 69. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 93. — Koch, *Dendr.* i. 576. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 63. — Engler, *De Candolle Monogr. Phaner.* iv. 377. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 52. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

R. **typhina,** var. **arborescens,** Willdenow, *Enum.* 323. — De Candolle, *Prodr.* ii. 67.

R. **typhina,** var. **frutescens,** Willdenow, *Enum.* 323. — De Candolle, *Prodr.* ii. 67.

A tree, occasionally thirty-five or forty feet in height, with copious milky white viscid juice turning black on exposure, a slender and often slightly reclining trunk twelve or fourteen inches in diameter, and stout, upright, often contorted branches which form a low flat head; or more frequently a tall shrub, spreading by underground shoots into broad thickets. The bark of the trunk is dark brown and is smooth, or occasionally separates into small square scales. The branchlets are thick and are coated with long soft hairs which are pink when they appear in early spring, later turn bright green and then brown, and are short and dark-colored in the second season. The branchlets, which do not become glabrous until after their third or fourth year, in their second season are marked with large leaf-scars and with small orange-colored lenticels which enlarge vertically with the expansion of the bark and do not disappear for several years. The winter-buds are protected by a covering of thick pale brown tomentum; the terminal bud is obtuse, with almost triangular scales, and is nearly twice the size of the globular axillary buds. The leaves are sixteen to twenty-four inches long and have stout stalks usually red on the upper side; these are covered with soft pale hairs, and, enlarged at the base, surround and inclose the buds developed in their axils. The leaflets are borne on very short thick petiolules and are oblong, rather remotely and sharply serrate or rarely laciniate, long-pointed, and rounded or slightly heart-shaped at the base, with stout midribs and primary veins forking near the margin; they are opposite, or the lower ones slightly alternate, the three or four middle pairs being considerably longer than those at the two extremities of the leaf. The back of the leaflets as they unfold, like the young shoots and the petioles, is covered with bright red hairs. The leaflets are bright yellow-green until they are half-grown, and at maturity are dark green and rather opaque on the upper surface, and pale or often nearly white on the lower surface, which is then glabrous with the exception of the short fine hairs which cover the midrib and occasionally appear on its upper surface. In the autumn they turn bright scarlet with shades of crimson, purple, and orange. The male and female flowers are usually produced separately on different individuals,[1] and in dense panicles with

[1] Perfect flowers, if they occur at all on *Rhus typhina,* are very rare; and, so far as I have been able to observe, the staminate plants never produce fruit, although their small ovaries often have well-developed stigmas. The flowers of the pistillate plants do not

pubescent stems and branches and acuminate bracts half an inch to nearly an inch long, or occasionally twice that length on the female plant, and deciduous with the opening of the flowers. The panicle of sterile flowers is from eight to twelve inches in length and five or six inches in breadth, with wide-spreading branches, and is nearly a third larger than the more compact inflorescence of the fertile plant. The flowers are borne on slender pedicels produced from the axils of small acute pubescent bractlets. The calyx-lobes are acute and are covered on the outer surface with long slender hairs; in the male flower they are much shorter than the petals, and in the female flower almost as long. The petals of the staminate flower are yellow-green sometimes tinged with red, strap-shaped, rounded at the apex and reflexed above the middle at maturity, while those of the pistillate flower are green, narrower and acuminate with a thickened slightly hooded apex, and remain erect or nearly so. The disk is bright red and conspicuous, especially in the staminate flower. The stamens in the sterile flower are slightly exserted, with slender filaments and large bright orange-colored anthers; in the fertile flower they are much shorter, with minute rudimentary anthers. The ovary is ovoid and pubescent, and is crowned by three short spreading styles slightly connate at the base with large capitate stigmas; in the staminate flower it is glabrous, much smaller, and usually rudimentary. The sterile trees flower from the middle to the end of June and the fertile trees a week or ten days later, the flowers of both opening gradually and in succession. The fruit is borne in dense panicles six to eight inches long and two to three inches broad. It is depressed-globular, with a thin outer covering clothed with long acrid crimson hairs, and a small pale brown bony stone. The seed is slightly reniform, with an orange-brown smooth testa. The fruit, fully grown and colored in August, does not ripen until October; the panicles remaining on the branches and retaining their color until the new leaves appear the following spring.[1]

Rhus typhina grows in New Brunswick and extends westward through the valley of the St. Lawrence to southern Ontario and Minnesota, and southward through the northern states and along the Alleghany Mountains to northern Georgia and to central Alabama and Mississippi. It is a common plant in nearly every part of this region, although it is more generally distributed on the Atlantic seaboard than in the region west of the Alleghany Mountains. It usually grows on uplands in good soil, spreading into broad thickets to the exclusion of other plants, but is sometimes found on sterile gravelly banks and near the borders of streams and swamps.

The wood of *Rhus typhina* is light, brittle, soft, and coarse-grained, with a satiny surface that takes a good polish. Its layers of annual growth are clearly defined by four to six rows of large open ducts; it contains numerous obscure medullary rays and is orange-color streaked with green, with thick nearly white sapwood. It has been employed in inlaying furniture made of other woods, but probably is now little used. The specific gravity of the absolutely dry wood is 0.4357, a cubic foot weighing 27.15 pounds. From the young shoots of this tree pipes are made for drawing the sap of the Sugar Maple. The bark, especially of the root, as well as the leaves, is rich in tannin.[2] An infusion made from the astringent and refrigerant fruit is occasionally employed as a gargle.[3]

Rhus typhina was known to Europeans in the beginning of the seventeenth century. It was first described by Caspar Bauhin[4] in 1623, and was cultivated in England by John Parkinson[5] as early as

open until after the anthers of many of the early staminate flowers have shed their pollen, and fertilization is dependent on the pollen produced by the later flowers. Bees visit the flowers of all our species of Rhus and probably secure their fertilization.

[1] Individual plants almost intermediate in character between *Rhus typhina* and *Rhus glabra* are occasionally found, indicating the possibility of natural hybrids between the two species.

See *Special Report No.* 20, *U. S. Dept. Agric.* 22, t. 3.

[2] Lawrence Johnson, *Man. Mat. Med. N. A.* 118.

The berries of *Rhus typhina*, or *Rhus glabra*, and of many other Sumachs have a sour, astringent, and rather agreeable flavor and can be eaten with impunity. Their acidity is confined to the hairs which cover the surface, and is due to malic acid and bimalate of calcium. (Kalm, *Travels*, English ed. i. 76. — *U. S. Dispens.* ed. 14, 772. — Guibourt, *Hist. Drog.* ed. 7, iii. 488.)

[4] *Rhus Virginianum*, *Pinax*, 521. — Ray, *Hist. Pl.* ii. 1591. — Plukenet, *Alm. Bot.* 318. — Miller, *Dict.* No. 1.

Rhus foliis pinnatis serratis, α. Linnæus, *Hort. Cliff.* 110.

Rhus foliis amplis pinnatis, racemis atro-rubentibus, Clayton, *Fl. Virgin.* 33.

[5] John Parkinson (1567–1650), a London apothecary, was herbalist to James I., a position due to his botanical writings and to the fame of his garden near London, in which many exotic plants were cultivated for the first time in England. His first publica-

1629.[1] The Staghorn Sumach is occasionally found in American gardens; and in central and northern Europe it is now one of the most common and popular exotic trees. It can be grown with a single stem for the decoration of the lawn, or it can be used with good effect to cover gravelly slopes, the margins of roads, and other waste places.

The excellent habit of the Staghorn Sumach, its ample and brilliantly colored foliage, its large panicles of male flowers, and its brilliant fruit make it one of the most beautiful of the small trees which inhabit the northern states.

The specific name, derived from τῦφος, relates to the supposed virtues of this plant in the treatment of fevers.

tion was the *Paradisi in Sole Paradisus Terrestris, or a garden of all sorts of pleasant flowers.* This was published in 1629, and is still interesting as it gives the best idea of the condition and contents of English gardens at the beginning of the seventeenth century. In 1640 appeared a much more comprehensive and important work from the pen of Parkinson, the *Theatrum Botanicum, the Theatre of Plants, or an Herbal of a large extent*, which was intended to include an account of all the plants described by earlier authors "encreased by the accesse of many hundreds of new, rare and strange Plants from all parts of the world." This book was Parkinson's life work, and was not published until ten years before his death. The Black Walnut, the Red Mulberry, and the Shellbark Hickory, as well as the Staghorn Sumach, are believed to have been first cultivated in England by Parkinson.

Parkinsonia, a genus of leguminous trees, natives of tropical America and southern Africa, with one of its species now widely distributed by cultivation through all the warmer parts of the world, commemorates Parkinson's services to botany and horticulture.

[1] *Sumach. Sive Rhus Virginiana. Virginian Sumacke. Theatr.* 1449, f. — Aiton, *Hort. Kew.* i. 365. — Loudon, *Arb. Brit.* ii. 550, f. 224.

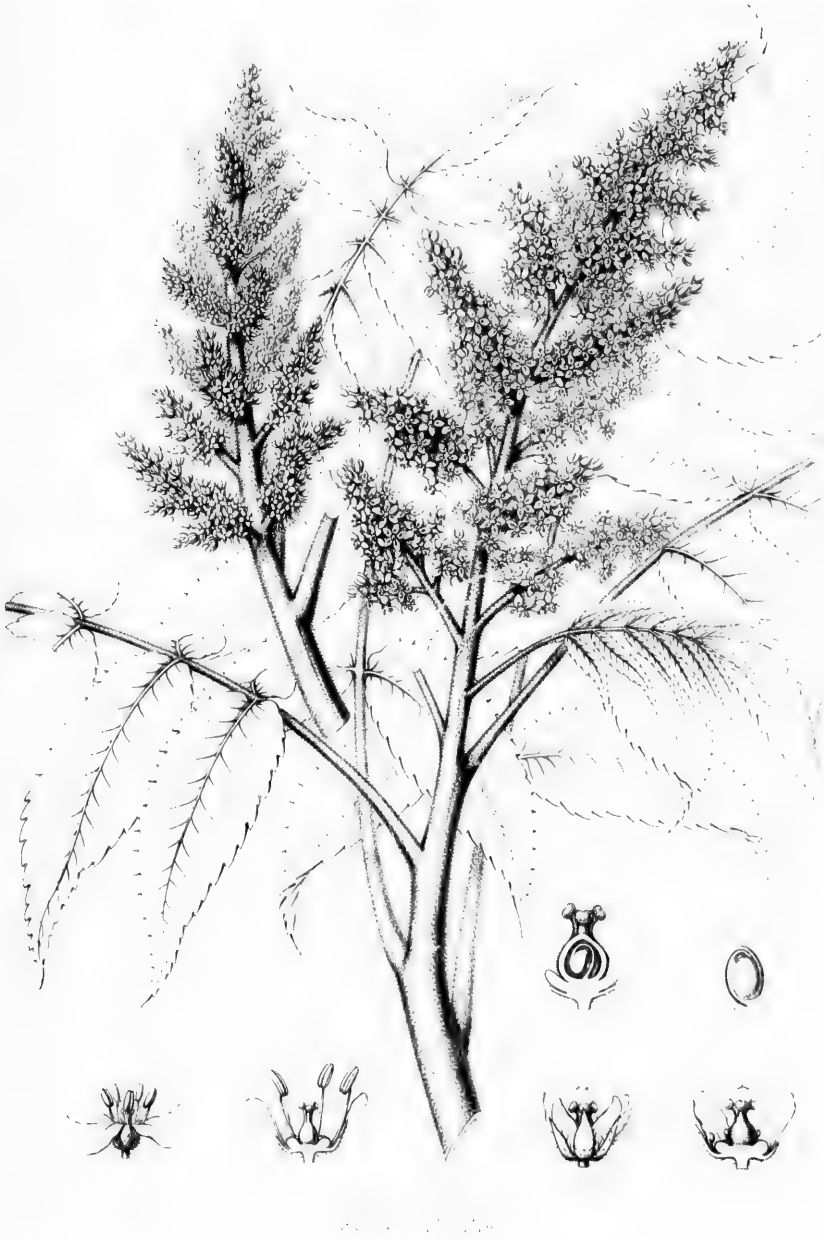
EXPLANATION OF THE PLATES.

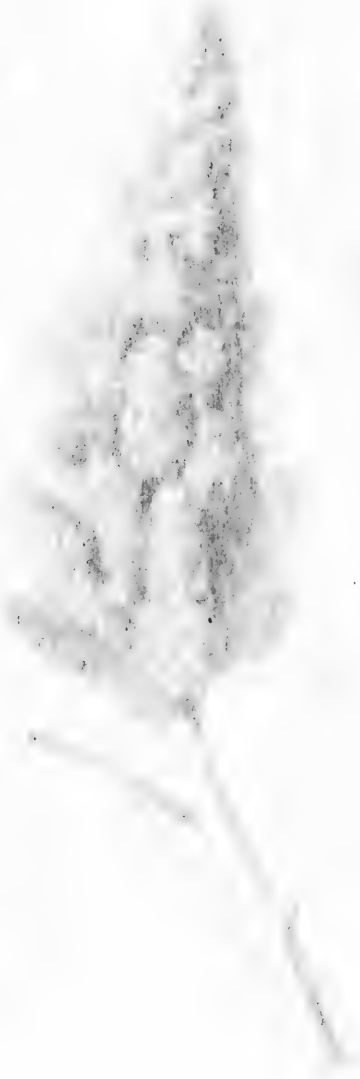
Plate CII. Rhus typhina.

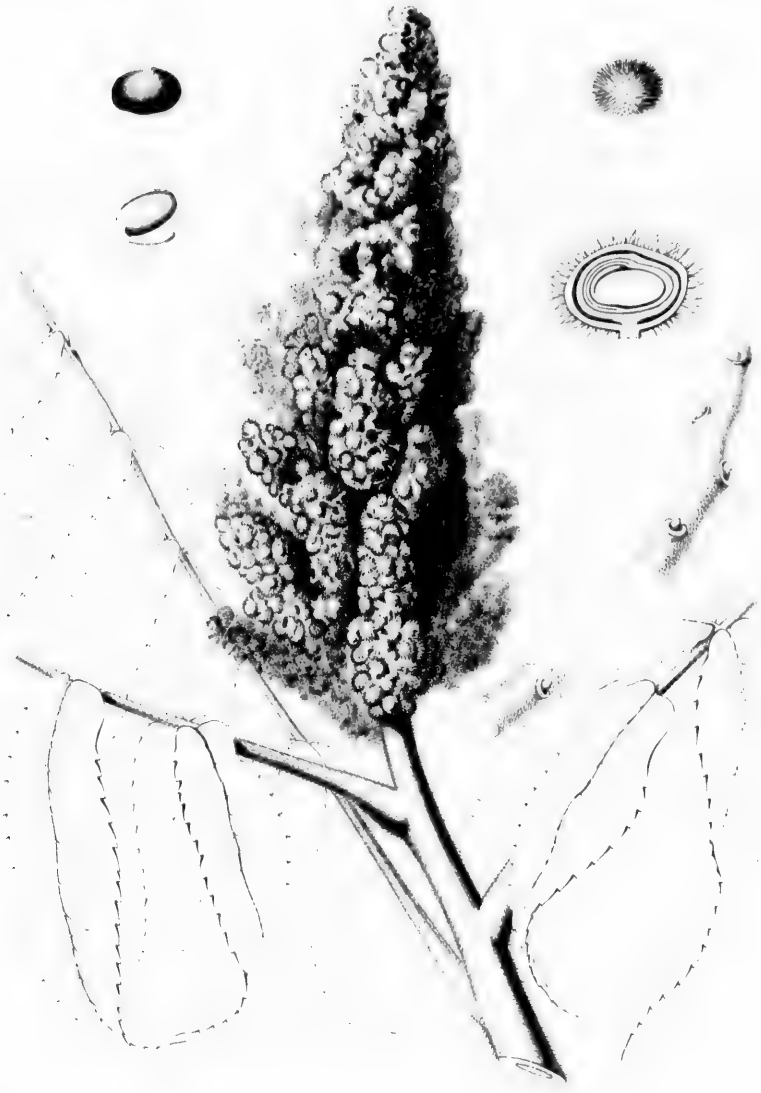
1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. Vertical section of a pistil, enlarged.
8. An ovule, much magnified.

Plate CIII. Rhus typhina.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, much enlarged.
4. A stone, enlarged.
5. An embryo, much magnified.
6. A winter branchlet, natural size.







RHUS COPALLINA.

Sumach.

Branches and leaf-stalks pubescent. Petioles wing-margined; leaflets 9 to 21, green on the lower surface. Fruit pilose.

Rhus copallina, Linnæus, *Spec.* 266. — Miller, *Dict.* ed. 8, No. 6. — Medicus, *Bot. Beob.* 1782, 224. — Marshall, *Arbust. Am.* 128. — Wangenheim, *Nordam. Holz.* 96. — Walter, *Fl. Car.* 255. — Gærtner, *Fruct.* i. 205, t. 44. — Aiton, *Hort. Kew.* i. 366. — Pleuck, *Icon.* t. 233. — Lamarck, *Ill.* ii. 346, t. 207, f. 3. — Jacquin, *Hort. Schoenb.* iii. 50, t. 341. — Willdenow, *Spec.* i. 1480; *Enum.* 324. — Michaux, *Fl. Bor.-Am.* i. 182. — Schkuhr, *Handb.* i. 237. — *Nouveau Duhamel*, ii. 160. — Persoon, *Syn.* i. 324. — Desfontaines, *Hist. Arb.* ii. 326. — Poiret, *Lam. Dict.* vii. 506. — Pursh, *Fl. Am. Sept.* i. 205. — Bigelow, *Fl. Boston.* 72. — Nuttall, *Gen.* i. 203. — Roemer & Schultes, *Syst.* vi. 647. — Hayne, *Dendr. Fl.* 34. — Elliott, *Sk.* i. 362. — Torrey, *Fl. N. Y.* i. 129. — De Candolle, *Prodr.* ii. 68. — Sprengel, *Syst.* i. 936. — Don, *Gen. Syst.* ii. 72. — Spach, *Hist. Vég.* ii. 214. — Torrey & Gray, *Fl. N. Am.* i. 217. — Dietrich, *Syn.* ii. 1003. — Loudon, *Arb. Brit.* ii. 554, f. 229. — Emerson, *Trees Mass.* 503. — Darlington, *Fl. Cestr.* ed. 3, 43. — Chapman, *Fl.* 69. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 92. — Koch, *Dendr.* i. 575. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 63. — Engler, *De Candolle Monogr. Phaner.* iv. 383. — Hemsley, *Bot. Biol. Am. Cent.* i. 217. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Watson & Coulter, *Gray's Man.* ed. 6, 119. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*).

A tree, twenty-five to thirty feet in height, with colorless watery juice, a short stout trunk eight or ten inches in diameter, and erect spreading branches; or at the north a low shrub rarely more than four or five feet high. The bark of the trunk varies from a third to half an inch in thickness; the surface, which is light brown tinged with red and is marked by large elevated dark red-brown circular excrescences, separates into large thin papery scales. The branchlets when they appear are dark green tinged with red, and are more or less densely clothed with short fine or sometimes ferrugineous pubescence,[1] and are marked by many minute dark red lenticels; they appear slightly zigzag by the end of the first season on account of the swellings formed by the prominent leaf-scars, and are then covered with pale red-brown slightly puberulous bark dotted with conspicuous dark-colored lenticels. The winter-buds are minute, nearly globular, and clothed with dark rusty brown tomentum. The leaves are six to eight inches long and have slender pubescent petioles with enlarged bases nearly surrounding and inclosing the buds formed in their axils. The stalk of the leaf is more or less broadly wing-margined between the leaflets, the wings increasing in width towards the point of the leaf, each pair being broadest in the middle and narrowed at the two extremities. The leaflets are oblong or ovate-lanceolate, entire or remotely serrate above the middle, sharp-pointed or rarely emarginate at the apex, and acute or obtuse and often unequal at the base. The lower pairs are short-petiolulate and smaller than those above the middle of the leaf; the others are sessile with the exception of the terminal leaflet, which is sometimes contracted into a long-winged stalk. When they unfold, the leaflets are dark green and slightly puberulous on the upper surface, especially along the midrib, and are covered on the lower surface with fine silvery white pubescence; at maturity they are an inch and a half to two inches and a half long, and three quarters of an inch broad, with slighty thickened and revolute margins and prominent midribs and primary veins, and are then subcoriaceous, the upper surface being lustrous, dark green, and glabrous with the exception of the midrib, and the lower surface pale and pubescent. In the autumn the upper surface turns a dark rich maroon color. The male and female flowers are produced on

[1] The branchlets on some plants in the east are slightly puberulous, while west of the Mississippi River from Missouri to Texas it is not unusual to find both branchlets and leaf-stalks clothed with dense ferrugineous tomentum.

separate plants in short compact pubescent panicles, the lower branches being developed from the axils of the upper leaves. The panicles are four to six inches long and three or four inches broad, and are usually rather smaller on the female than on the male plant. The bracts and bractlets, which fall before the expansion of the flowers, are ovate or oblong and densely cinereo-pilose. The pedicels are stout and pubescent, and vary from an eighth to a quarter of an inch in length. The calyx is puberulous on the outer surface; its ovate acute segments are a third of the length of the ovate greenish yellow petals, which are rounded at the apex and at maturity are reflexed above the middle. The disk is red and conspicuous. The stamens are somewhat longer than the petals, with slender filaments and large orange-colored anthers; in the fertile flower they are much shorter than the petals and have minute rudimentary anthers. The ovary is ovate, pubescent, and contracted into three short thick spreading styles with large capitate stigmas; in the staminate flower it is glabrous and much smaller. In Texas the flowers appear in June, and in New England during the first days of August, those of the sterile plant opening in succession during nearly a month and continuing to unfold long after those of the fertile plant have fallen. The fruit ripens in five or six weeks, and is borne in stout compact often nodding clusters with pubescent stems and branches, which sometimes remain on the plants until the beginning of the following summer. The drupe is an eighth of an inch across, slightly obovate, and more or less flattened, with a thin bright red coat covered with short fine glandular hairs, a smooth bony orange-brown stone, and a reniform seed with a broad funicle and a smooth orange-colored testa.

Rhus copallina is widely and generally distributed from northern New England to Manatee and the shores of Caximbas Bay, Florida, and to Missouri, Arkansas, and the valley of the San Antonio River in Texas, and occurs in Cuba. It occupies dry hillsides and ridges, and becomes truly arborescent only in southern Arkansas and in eastern Texas; east of the Mississippi River it rarely grows more than a few feet high, and, spreading by underground stems, forms broad thickets on gravelly sterile land.

The wood of *Rhus copallina* is light, soft, and coarse-grained, with a satiny surface. It contains many thin obscure medullary rays and rows of large open ducts marking the layers of annual growth. It is light brown streaked with green and often tinged with red; the thin light-colored sapwood is composed of four or five layers of annual growth. The specific gravity of the absolutely dry wood is 0.5273, a cubic foot weighing 32.86 pounds.

The leaves, like those of the other species of the genus, are rich in tannin, and in some parts of the country, principally in Maryland, West Virginia, and Tennessee, they are gathered in large quantities and are ground for curing leather and for dyeing.[1] The acid and astringent fruit possesses the same properties and is used for the same purposes as the fruit of the other North American Sumachs.

Rhus copallina varies considerably in the size and form of its leaflets. The most distinct and probably the most constant of the varieties is var. *lanceolata*,[2] a small tree found from the prairies of eastern Texas to the valley of the Rio Grande. It is distinguished by its narrower acute often falcate and entire leaflets, and by its larger inflorescence and fruit. This plant grows to the height of twenty-five or thirty feet, with a trunk sometimes eight inches in diameter, covered with dark gray bark marked with red lenticular excrescences. It inhabits dry limestone uplands, often forming large thickets on river bluffs, about the heads of prairie ravines, and near the banks of small streams. The flowers appear in July or August, and the fruit, which is dull red or sometimes green, ripens in early autumn and falls before the beginning of winter. The specific gravity of the absolutely dry wood of this variety is 0.5184, a cubic foot weighing 32.31 pounds.

[1] *Special Report No.* 26, *U. S. Dept. Agric.* 26, t. 5.

[2] Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 158 (*Pl. Lindheim.* ii.). — Torrey, *Bot. Mex. Bound. Surv.* 44. — Watson, *Proc. Am. Acad.* xvii. 338. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix 53. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*)

A variety[1] of *Rhus copallina* with white flowers occurs on rocky cliffs near New Braunfels in Texas.[2]

Rhus copallina was one of the rare exotic trees cultivated by Bishop Compton[3] in his garden at Fulham near London, to which it had probably been sent from Virginia by Bannister;[4] and the first description of the species was drawn up from this cultivated plant and published by Ray in the *Historia Plantarum*[5] in 1688.

The foliage of *Rhus copallina* is more beautiful in summer and in autumn than that of the other North American Sumachs; and although it does not usually grow to the size of the Staghorn Sumach, or bear such conspicuous flowers and fruit, it is a beautiful and attractive plant, and especially useful when slopes of sterile gravel or rocky hillsides are to be clothed with shrubs.

The specific name was given to it by Linnæus under the mistaken idea that this plant furnished the copal gum of commerce.

[1] *Rhus copallina*, var. *leucantha*, De Candolle, *Prodr.* ii. 68. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 158 (*Pl. Lindheim.* ii.). — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 53. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*).

R. leucantha, Jacquin, *Hort. Schoenb.* iii. 50, t. 342. — Spach, *Hist. Vég.* ii. 215.

[2] Engler (*De Candolle Monogr. Phaner.* iv. 384) distinguishes the following forms: —

Var. *latifolia*, with oblong or oblong-elliptical leaflets two and a half to three times as long as broad, the wings broad or narrow.

Var. *angustialata*, with a wing scarcely one twenty-fourth of an inch broad (Cuba, Wright, No. 2290). (*R. copallina*, var. Grisebach, *Cat. Pl. Cub.* 67.)

Var. *latialata*, with a wing from one twelfth to one sixth of an inch broad.

Var. *angustifolia*, with lanceolate leaflets five to six times longer than broad.

Var. *integrifolia*.

Var. *serrata*.

[3] See i. 6.

[4] See i. 6.

[5] *Rhus Virginianum Lentisci foliis*, ii. 1799.

Rhoi Obsoniorum similis Americana, Gummi candidum fundens, non serrata, foliorum rachi medio alata, Plukenet, *Phyt.* t. 56, f. 1; *Alm. Bot.* 318.

Rhus foliis pinnatis, pedunculo communi membranaceo articulato, Royen, *Fl. Leyd. Prodr.* 241. — Linnæus, *Mat. Med.* 50.

Rhus elatior foliis cum impari pinnatis, petiolis membranaceis articulatis, foliolis minoribus nonnunquam non exacte oppositis: racemis atrorubentibus, Clayton, *Fl. Virgin.* 149.

EXPLANATION OF THE PLATES.

PLATE CIV. RHUS COPALLINA.

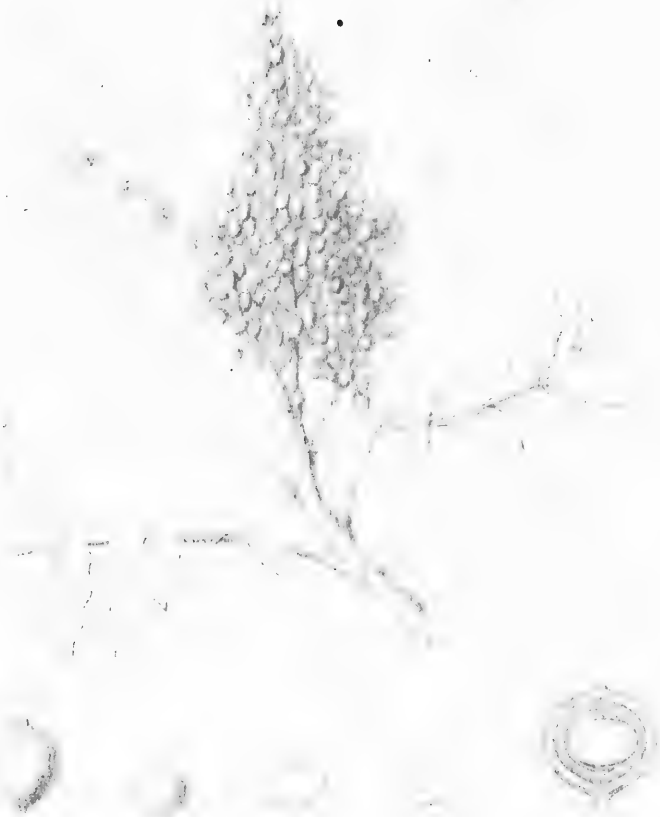
1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A pistil, enlarged.
8. An ovule, much magnified.

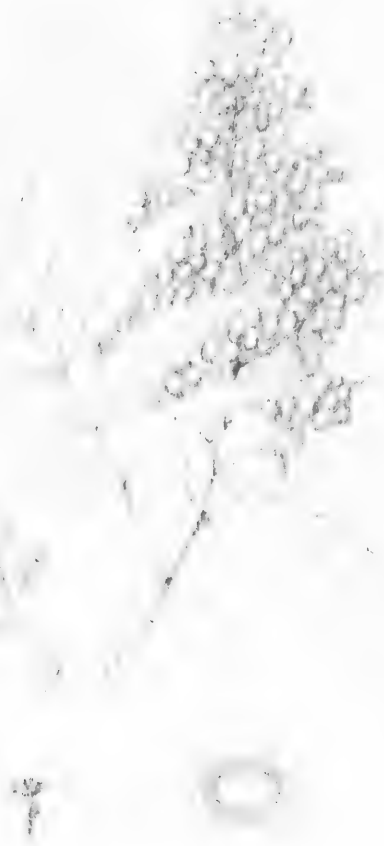
PLATE CV. RHUS COPALLINA.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. A stone, enlarged.
5. A seed, enlarged.
6. An embryo, much magnified.
7. A winter branchlet, natural size.

PLATE CVI. RHUS COPALLINA, *var.* LANCEOLATA.

1. A branch of a staminate panicle, natural size.
2. A branch of a pistillate panicle, natural size.
3. A staminate flower, enlarged.
4. A pistillate flower, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a fruit, enlarged.





RHUS VERNIX.

Poison Dogwood. Poison Sumach.

FLOWERS diœcious, in axillary panicles. Fruit globular, white; the stone striate. Leaves 7 to 13-foliolate.

Rhus Vernix, Linnæus, *Spec.* 265. — Medicus, *Bot. Beob.* 1782, 223. — Marshall, *Arbust. Am.* 130. — Wangenheim, *Nordam. Holz.* 92. — Castiglioni, *Viag. negli Stati Uniti*, ii. 356, t. 14. — Plenck, *Icon.* t. 234. — Lamarck, *Ill.* ii. 346, t. 207, f. 2. — Willdenow, *Spec.* i. 1479; *Enum.* 323. — Schkuhr, *Handb.* i. 236. — Michaux, *Fl. Bor.-Am.* i. 183. — *Nouveau Duhamel*, ii. 165. — Persoon, *Syn.* i. 324. — Desfontaines, *Hist. Arb.* ii. 325. — Poiret, *Lam. Dict.* vii. 505. — Bigelow, *Fl. Boston.* 72. — Nuttall, *Gen.* i. 203. — Pursh, *Fl. Am. Sept.* i. 205. — Roemer & Schultes, *Syst.* vi. 646. — Hayne, *Dendr. Fl.* 34. — Elliott, *Sk.* i. 362. — Sprengel, *Syst.* i. 936.

Toxicodendron pinnatum, Miller, *Dict.* ed. 8, No. 4.

R. venenata, De Candolle, *Prodr.* ii. 68. — Hooker, *Fl. Bor.-Am.* i. 126. — Don, *Gen. Syst.* ii. 71. — Spach, *Hist. Vég.* ii. 215. — Torrey & Gray, *Fl. N. Am.* i. 218, 681. — Dietrich, *Syn.* ii. 1003. — Torrey, *Fl. N. Y.* i. 130. — Emerson, *Trees Mass.* ed. 2, ii. 575, t. — Darlington, *Fl. Cestr.* ed. 3, 44. — Chapman, *Fl.* 69. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 93. — Bailey, *Am. Nat.* vii. 5, f. 3. — Engler, *De Candolle Monogr. Phaner.* iv. 397. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 54. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

A small tree, with acrid poisonous juice turning black on exposure, occasionally twenty or twenty-five feet in height, with a trunk five or six inches in diameter, and slender rather pendulous branches forming a narrow round head; or more often a shrub sending up from the ground a cluster of slender stems. The bark of the trunk is thin, smooth, or sometimes slightly striate and pale light gray in color. The branchlets are glabrous when they appear, reddish brown and covered with minute orange-colored lenticular spots; they are orange-brown at the end of the first season, and a year later are light gray and still marked by lenticels and by large elevated conspicuous leaf-scars. The winter-buds are acute and covered with dark purple scales puberulous on the back and margins with short pale hairs; the terminal bud varies from an eighth of an inch to nearly an inch in length and is two or three times larger than the axillary buds. The leaves are from seven to fourteen inches in length, and are borne on slender petioles which are usually light red or red streaked with green on the upper side. The leaflets are obovate-oblong with entire revolute margins, and are slightly unequal at the base and contracted at the acute or rounded apex; they are short-petiolulate with the exception of the terminal one, which is sometimes raised on a stalk an inch in length. The leaflets when they unfold are bright orange-colored and coated, especially on the margins and under surface, with fine pubescence; they soon become glabrous, and at maturity are three or four inches long and an inch and a half or two inches broad, dark green and lustrous on the upper surface and pale on the lower, with prominent midribs scarlet above, primary veins forking near the margin, and conspicuous reticulated veinlets. In October they turn to brilliant scarlet or orange and scarlet colors. The staminate and pistillate flowers are produced on different plants in long narrow axillary pubescent panicles aggregated near the ends of the branches. The bracts and bractlets are acute, pubescent, and early deciduous. The pedicels are slender, pubescent, and bibracteate near the middle. The calyx-lobes are acute and a third of the length of the yellow-green acute petals, which are erect and slightly reflexed towards the apex. The stamens are nearly twice as long as the petals, with slender filaments and large orange-colored anthers; in the fertile flower they are not more than half the length of the petals, with small rudimentary anthers. The ovary is ovoid-globose and surmounted by three short thick spreading styles terminating in large capitate stigmas. The flowers appear late in June or early in July. The fruit ripens in September and often hangs on the branches until the following spring; it is produced in long graceful racemes

and is often flattened and slightly gibbous, and is tipped with the dark remnants of the styles. The outer coat is thin, more or less striated at maturity, ivory white or white tinged with yellow, and very lustrous; the stone is conspicuously grooved, thin, rather membranaceous than coriaceous, and, like the testa of the seed, pale yellow.

Rhus Vernix is common in all the region between northern New England and northern Georgia and Alabama, and extends westward to northern Minnesota and to Arkansas and western Louisiana, inhabiting wet swamps often inundated during a portion of the year.

The wood of *Rhus Vernix* is light, soft, and coarse-grained, with three or four rows of large open ducts clearly defining the layers of annual growth, and thin, very obscure medullary rays. It is light yellow streaked with brown, the sapwood being lighter colored, and when absolutely dry has a specific gravity of 0.4382, a cubic foot weighing 27.31 pounds.

Rhus Vernix is one of the most dangerous plants of the North American flora. The juices and the effluvium from the flowers possess the properties found in those of *Rhus Metopium* and *Rhus Toxicodendron*, and to most persons are even more injurious.[1] The extreme brilliancy and beauty in autumn of the foliage of the Poison Dogwood,[2] as this plant is almost invariably called in the northern states, allure many people ignorant of its true character to gather and handle it, and cases of serious poisoning are a common consequence. It contains the volatile principle toxicodendric acid found in the allied *Rhus Toxicodendron*, and possesses properties of as great medicinal value as that plant.[3] An infusion of the young branches and leaves is employed in homœopathic practice;[4] and the juice can be used as a black lustrous durable varnish very similar to that furnished by the Japanese Lacquer-tree.[5]

Rhus Vernix was first described by Plukenet in the *Phytographia*[6] published in 1691, and was cultivated in the Physic Garden at Chelsea[7] in England as early as 1713.[8]

[1] Kalm, *Travels*, English ed. i. 77. — Cutler, *Mem. Am. Acad.* i. 428. — B. S. Barton, *Coll.* i. 24. — Bigelow, *Med. Bot.* i. 96, t. 10. — *U. S. Dispens.* ed. 14, 908. — *Nat. Dispens.* ed. 2, 1464. — James C. White, *Dermatitis Venenata*, 31.

[2] *Rhus Vernix* is also known in some parts of the country as Poison Elder and as Poison-tree.

[3] Lawrence Johnson, *Man. Med. Bot. N. A.* 118.

[4] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 37, t. 37.

[5] Bigelow, *l. c.*

[6] *Arbor Americanus alatis foliis, succo lacteo venenata, Phyt.* t. 145, f. 1; *Mem. Bot.* 45.

Rhus Americanum rachi (cui adnectuntur folia) rubra, folio lato utrinque glabro non serrato, pistachiæ simili, Boerhaave, *Hort. Lugd. Bat.* ii. 229. — Colden, *Cat. Pl. Novebor.* 64.

Arbor cujus lignum venenatum, Paul Dudley, *Phil. Trans.* xxxi. 145. — Sherard, *Phil. Trans.* xxxi. 147.

Toxicodendron Carolinianum, foliis pinnatis, floribus minimis herbaceis, Miller, *Dict.* No. 3.

Toxicodendron foliis alatis, fructu rhomboideo, Dillenius, *Hort. Elth.* 390, t. 292, f. 377.

Rhus foliis pinnatis integerrimis, Linnæus, *Hort. Cliff.* 110; *Hort. Ups.* 68; *Mat. Med.* 50. — Royen, *Fl. Leyd. Prodr.* 244. — Clayton, *Fl. Virgin.* 148.

[7] Aiton, *Hort. Kew.* i. 366. — Loudon, *Arb. Brit.* ii. 552, f. 226.

[8] The confusion which has long existed with reference to the name of this plant was due to the fact that Linnæus, misled by the similarity of the Japanese Varnish-tree, united this with the American Poison Sumach, calling the species thus enlarged *Rhus Vernix*, the name, of course, relating to the properties of the Japanese and not of the American plant. De Candolle found that the two plants were distinct and made new names for them both, dropping entirely the Linnæan specific name *Vernix*. This, however, is the oldest name, and clearly belongs to the American and not to the Japanese plant, as Linnæus's description in the *Hortus Cliffortianus*, as well as that in the *Species Plantarum*, makes it clear that he considered the American plant as the type of his species to which he referred the Japanese plant of Kaempfer. (See in this connection discussions upon the differences in the two trees by Abbé Mazeas, Philip Miller, and John Ellis. *Phil. Trans.* xlix. 157, 161, 866.)

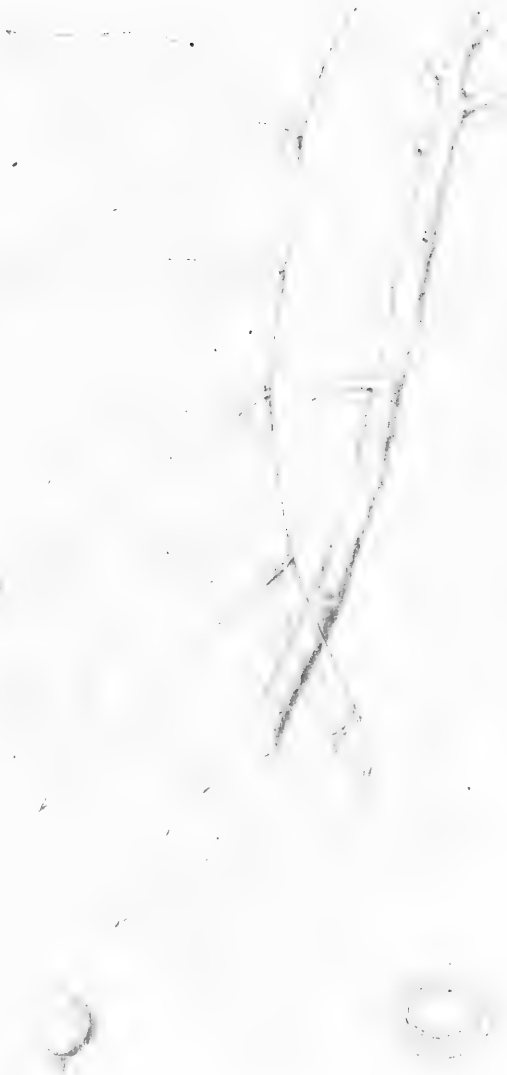
EXPLANATION OF THE PLATES.

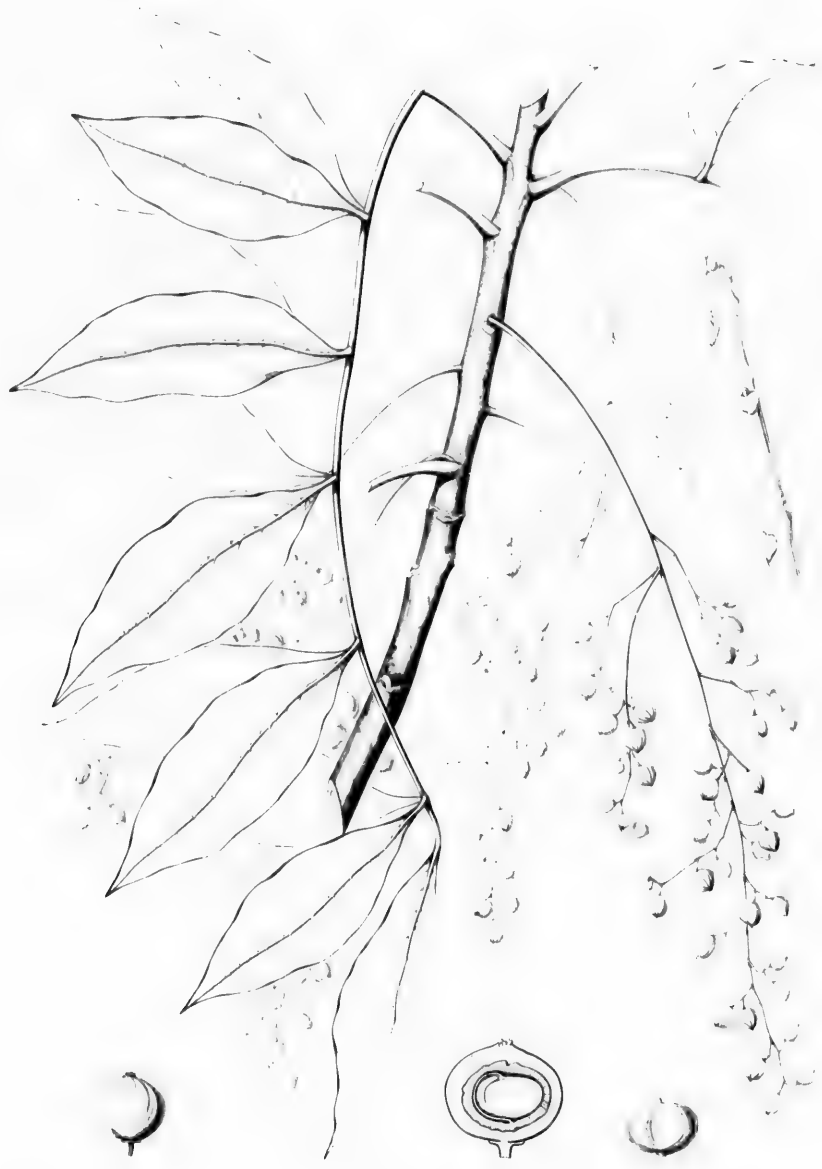
PLATE CVII. RHUS VERNIX.

1. A branch of the staminate tree, natural size.
2. A branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. An ovule, much magnified.

PLATE CVIII. RHUS VERNIX.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. A stone, enlarged.
5. A winter branchlet, natural size.





RHUS INTEGRIFOLIA.

Mahogany.

FLOWERS diœcious or polygamo-diœcious, on conspicuously bracteate pedicels; sepals orbicular, colored. Fruit pubescent. Leaves usually simple, persistent.

Rhus integrifolia, Bentham & Hooker, *Gen.* i. 419. — Brewer & Watson, *Bot. Cal.* i. 110. — Greene, *Bull. Cal. Acad.* ii. 393; *Pittonia*, i. 87, 201. — Engler, *De Candolle Monogr. Phaner.* iv. 387. — T. S. Brandegee, *Proc. Cal. Acad.* ser. 2, i. 208; ii. 139. — Sargent, *Garden and Forest*, ii. 375.

Styphonia integrifolia, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 220; *Sylva*, iii. 4, t. 82. — Dietrich, *Syn.* ii. 1226. — Bentham, *Bot. Voy. Sulphur*, 11. — Walpers, *Rep.* i. 555; v. 414. — Torrey, *Bot. Mex. Bound. Surv.* 44. — Gray, *Ives' Rep.* 9.

Styphonia serrata, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 220; *Sylva*, iii. 6. — Dietrich, *Syn.* ii. 1226. — Walpers, *Rep.* v. 414.

Rhus integrifolia, var. **serrata**, Engler, *De Candolle Monogr. Phaner.* iv. 388.

A low evergreen tree, rarely thirty feet in height, with a short stout trunk two to three feet in diameter, and numerous long spreading branches; or usually a small often almost prostrate shrub. The surface of the bark, which varies from a quarter of an inch to half an inch in thickness, is bright reddish brown and exfoliates in large plate-like scales. The branchlets are bright reddish brown and are marked with many small elevated lenticels, and when they appear are covered with thick pale pubescence which gradually disappears in their second and third years. The winter-buds are small, obtuse, and clothed with a thick coat of pale tomentum. The leaves are simple or rarely ternate,[1] with thickened revolute or spinosely toothed margins, and are pointed or rounded at the apex; they are puberulous when young, and at maturity are an inch and a half to three inches long, an inch to an inch and a half broad, thick and coriaceous, dark yellow-green on the upper surface, paler below, and glabrous with the exception of the stout petioles, broad thick midribs, and prominent reticulated veins. The flowers, which appear from February to April, are a quarter of an inch across when expanded, and are borne in short dense racemes forming hoary-pubescent terminal panicles an inch to three inches in length, the males and females on different plants. The pedicels are short and stout and are furnished with from two to four broadly ovate pointed persistent scarious ciliate and pubescent bracts. The sepals are rose-color, orbicular and concave, with scarious ciliate margins, and are rather less than half the length of the rounded ciliate reflexed rose-colored petals. The disk is annular, broad, and fleshy. The stamens are as long as the petals, with slender filaments and pale anthers, and in the fertile flower are minute and rudimentary. The ovary is broadly ovate, pubescent, and surmounted by three short thick connate styles with large capitate stigmas. The fruit is half an inch in length, ovate, flattened, more or less gibbous, with thick dark red densely pubescent and resinous viscid juice and a kidney-shaped smooth light chestnut-brown stone which has thick walls, and a flat seed with a thin pale coat and a broad dark-colored funicle covering its side.

Rhus integrifolia is found in the immediate neighborhood of the Pacific coast from Santa Barbara to the shores of Magdalena Bay in Lower California and on the Santa Barbara and Cedros Islands. It usually occurs in sandy sterile soil along the sea-beaches and bluffs, in California rising generally to the height of one or two feet only and forming close impenetrable thickets which offer the least possible resistance to the ocean gales.[2] In more sheltered situations and on some of the islands[3] it assumes a

[1] W. S. Lyon, *Bot. Gazette*, xi. 205, 333. — T. S. Brandegee, *Zoë*, i. 111, t. 4, f. 3–7 (*Plants of Santa Catalina Island*).

[2] C. R. Orcutt, *The Western American Scientist*, vii. 149.

[3] Professor Edward L. Greene noticed on San Miquel, one of the smaller of the Santa Barbara group, that the sands drifting from the beaches had almost entirely exterminated this species

tree-like habit, probably attaining its greatest size on the shores of Todos Santos Bay in Lower California.

The wood of *Rhus integrifolia* is hard and heavy, with bands of open ducts distinctly marking the layers of annual growth, and many thin conspicuous medullary rays. It is of a handsome bright clear red color, with thin pale sapwood composed of eight or ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.7830, a cubic foot weighing 48.80 pounds.[1] It possesses a high fuel value, and is cut and consumed in large quantities in the regions where it abounds.

The berries, from which a white oily acid substance exudes, are occasionally used in southern California in the preparation of a cooling beverage,[2] either fresh or after having been roasted and ground.

Rhus integrifolia was discovered by Thomas Nuttall[3] in 1835 in the neighborhood of San Diego.

once abundant on the island, as shown by the remnants of dead trees which have furnished fuel to the parties of seal hunters and fishermen who for years have frequented the island. One of these skeleton trees had produced gnarled branches thirty feet in length, spreading out horizontally and not more than a foot above the surface of the ground (*Pittonia*, i. 78).

[1] *Garden and Forest*, iii. 332.

[2] C. R. Orcutt, *The Western American Scientist*, iii. 46.

[3] See ii. 34.

EXPLANATION OF THE PLATE.

PLATE CIX. RHUS INTEGRIFOLIA.

1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, enlarged.
9. An embryo, much magnified.

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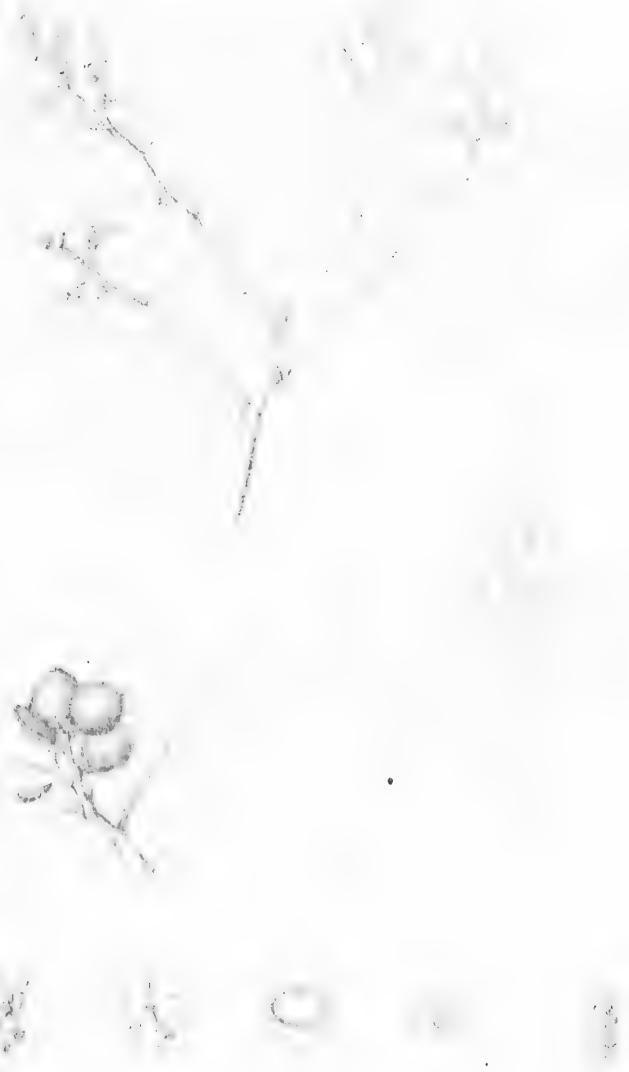


EYSENHARDTIA.

Flowers in dense spicate racemes; calyx 5-toothed; petals erect, free; ovary subsessile, 2 to 3 or rarely 4-ovuled. Legume small, compressed; seeds oblong-reniform, solitary or rarely 2. Leaves unequally pinnate.

Eysenhardtia, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 489. — Meisner, *Gen.* 89. — Endlicher, *Gen.* 1270. — Bentham & Hooker, *Gen.* i. 492. — Baillon, *Hist. Pl.* ii. 287.

Viborquia, Ortega, *Dec.* v. 66 (not Thunberg nor Moench).

Varennea, De Candolle, *Mém. Légum.* 494.

Small glandular-punctate trees or shrubs, with slender terete branches. Leaves alternate, unequally pinnate; stipules subulate, caducous; leaflets oblong, mucronate or emarginate at the apex, short-petiolulate, numerous, stipelate. Flowers short-pedicellate, in long spicate racemes, terminal or produced from the axils of the upper leaves. Bracts subulate, caducous. Calyx tubular-campanulate, conspicuously glandular-punctate, five-toothed, the acute teeth nearly equal, persistent. Disk cupuliform, adnate to the base of the calyx-tube. Corolla subpapilionaceous; petals erect, free, nearly equal, oblong-spatulate, rounded at the apex, unguiculate, creamy white; the standard concave, slightly broader than the wings and keel. Stamens ten, inserted with the petals, diadelphous, the superior one free, shorter than the others, the remainder united above the middle into a tube; anthers uniform, oblong, attached on the back at the middle, two-celled, the cells opening longitudinally. Ovary subsessile, contracted into a long slender uncinate style, geniculate and conspicuously glandular below the apex; stigma introrse, oblique; ovules two or three, rarely four, attached to the interior angle of the ovary, superposed, descending, amphitropous. Legume small, oblong or linear-falcate, compressed, tipped with the remnants of the style, indehiscent, pendent or erect. Seed usually solitary, rarely two, oblong-reniform, destitute of albumen; testa coriaceous. Embryo filling the cavity of the seed; cotyledons flat, fleshy; radicle superior, short and erect.

Eysenhardtia belongs to the warmer parts of the New World, where it is found in the region from western Texas and Arizona to southern Mexico, Lower California, and Guatemala. Four species are distinguished. The type of the genus, *Eysenhardtia polystachya*,[1] a slender shrub, is widely distributed through western Texas south of the Colorado River and is common in the Mexican Sierra Madre. *Eysenhardtia spinosa*,[2] a low intricately branched shrub, occurs on the mountain ranges of Chihuahua and in Lower California, and *Eysenhardtia orthocarpa*, sometimes a small tree, on those of western Texas, New Mexico, Arizona, and northern Mexico. *Eysenhardtia adenostylis*,[3] the most southern species of the genus yet discovered, is known only in Guatemala.

[1] *Eysenhardtia polystachya.*

Viborquia polystachya, Ortega, *Dec.* v. 66, t. 9.

E. amorphoides, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 491, t. 592. — De Candolle, *Prodr.* ii. 257. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 173 (*Pl. Lindheim.* ii.). — Hemsley, *Bot. Biol. Am. Cent.* i. 235. — Watson, *Proc. Am. Acad.* xvii. 339. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 76 (*Man. Pl. W. Texas*).

Varennea polystachya, De Candolle, *l. c.* 522.

[2] Engelmann, *Jour. Bost. Soc. Nat. Hist.* vi. 174 (*Pl. Lindheim.* ii.). — Hemsley, *l. c.* — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 148 (*Pl. Baja Cal.*).

[3] Baillon, *Adansonia*, ix. 239.

The wood of some species is hard and close-grained and affords valuable fuel. The genus is not known to possess other useful properties.

The generic name commemorates the botanical labors of Karl Wilhelm Eysenhardt,[1] professor of botany in the University of Königsberg.

[1] Karl Wilhelm Eysenhardt (1794–1825), a native of Berlin, gave promise in a number of scientific papers of a brilliant career closed by death almost at its beginning.

EYSENHARDTIA ORTHOCARPA.

LEAVES composed of 10 to 23 pairs of leaflets. Legume nearly straight, pendent.

Eysenhardtia orthocarpa, Watson, *Proc. Am. Acad.* xvii. 339. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 76 (*Man. Pl. W. Texas*).

E. amorphoides, var. orthocarpa, Gray, *Smithsonian Contrib.* v. 37 (*Pl. Wright.* ii.).

E. amorphoides, Torrey, *Bot. Mex. Bound. Surv.* 51 (in part).

A small tree, occasionally eighteen or twenty feet in height, with a trunk six or eight inches in diameter, separating, three or four feet above the ground, into a number of slender branches; or more often a low rigid shrub. The bark of the trunk is a sixteenth of an inch thick, light gray, and broken into large plate-like scales, their surface exfoliating in thin layers. The branchlets are at first coated with ashy gray pubescence; this disappears during the second year, when they are reddish brown and roughened with numerous glandular excrescences. The leaves are four or five inches long, with pubescent midribs grooved on the upper side, ten to twenty-three pairs of leaflets, and small scarious deciduous stipules. The leaflets are oval, rounded or sometimes slightly emarginate at the apex, with stout petiolules and minute scarious deciduous stipels, and are furnished on the lower side with conspicuous chestnut-brown glands; they are pale gray-green, glabrous or slightly puberulous on the upper surface, pubescent below, especially along the prominent midrib, reticulate-veined, and conspicuously glandular-punctate, with thickened slightly revolute margins, and vary from half to two thirds of an inch in length and from an eighth to a quarter of an inch in breadth. The flowers are produced in May in axillary pubescent spikes three or four inches long; they are borne on slender pubescent pedicels and are rather less than half an inch long. The calyx is many-ribbed, pubescent, covered with large and conspicuous glands, and half the length of the white petals, which vary little in size and shape and are ciliate on their margins. The legume is half an inch long, pendent, nearly straight or slightly falcate, conspicuously thickened on the two edges, and usually contains a single seed near the apex.

Eysenhardtia orthocarpa is found from the valley of the upper Guadaloupe River in western Texas to the Santa Catalina and Santa Rita mountains of southern Arizona, and extends southward into Mexico to the neighborhood of San Luis Potosí and to southwestern Chihuahua. It grows in gravelly soil on arid slopes and dry ridges, and is only known to assume an arborescent form near the summit of the Santa Catalina Mountains.

The wood of *Eysenhardtia orthocarpa* is heavy, hard, and close-grained, with numerous rows of open ducts clearly marking the layers of annual growth, and many thin medullary rays. It is light reddish brown in color, with thin clear yellow sapwood composed of seven or eight layers of annual growth. The specific gravity of the absolutely dry wood is 0.8740, a cubic foot weighing 54.47 pounds.

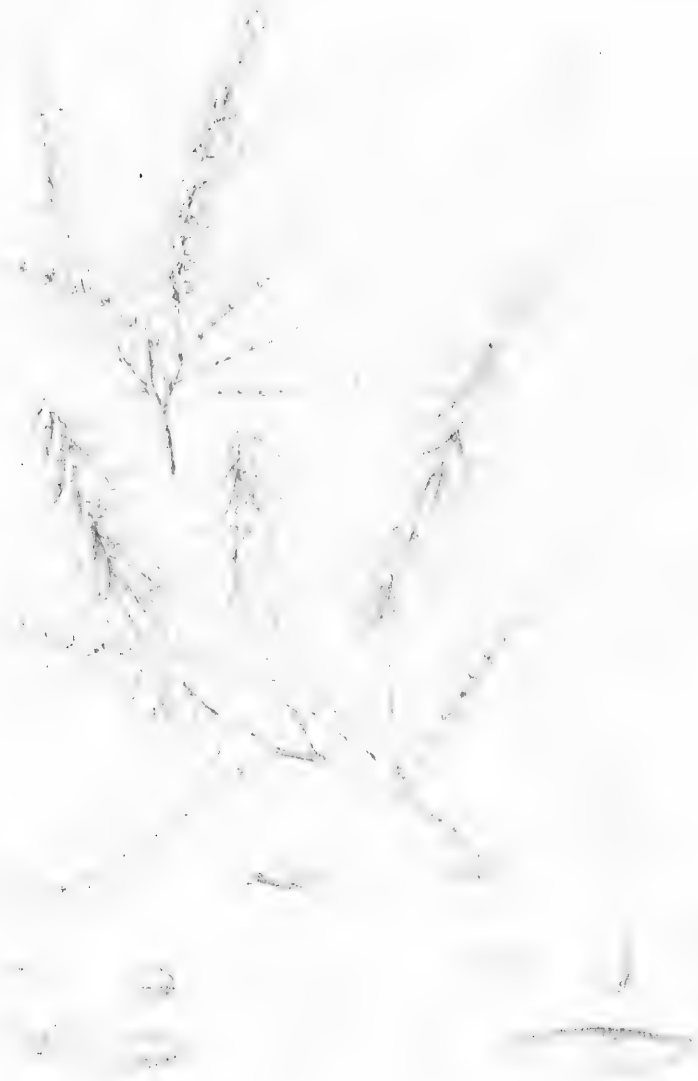
Eysenhardtia orthocarpa was discovered by Charles Wright[1] in August, 1849, on the banks of a stream between the Pecos and Limpia rivers in western Texas.

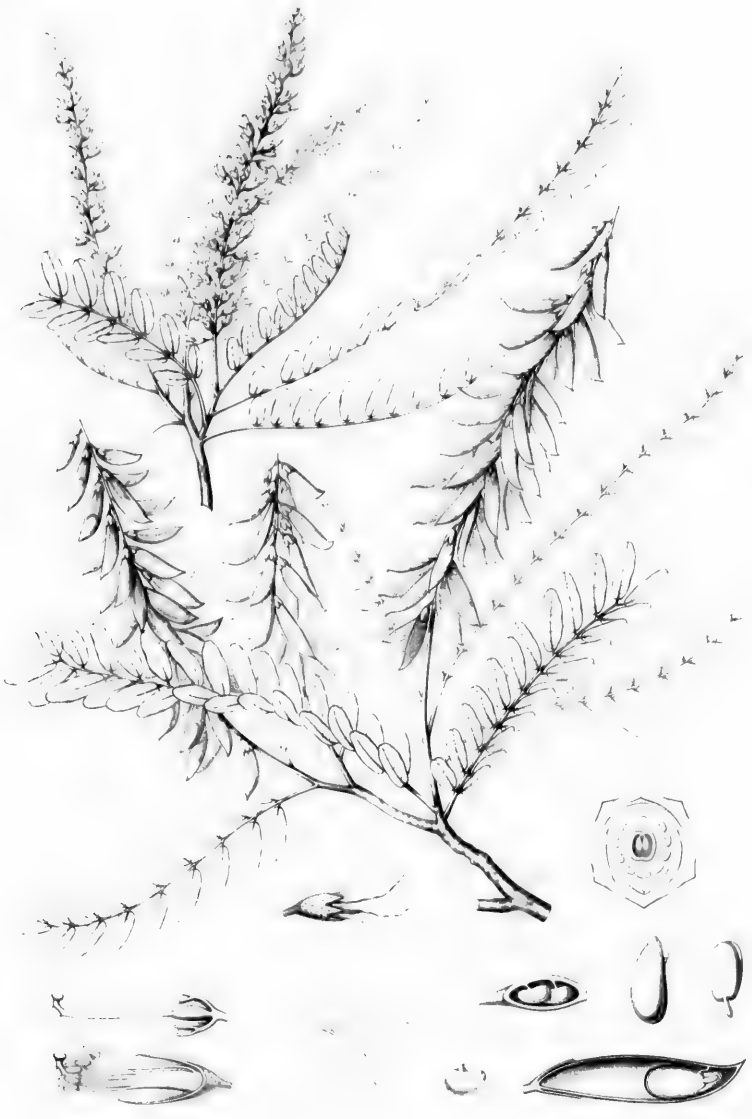
[1] See i. 94.

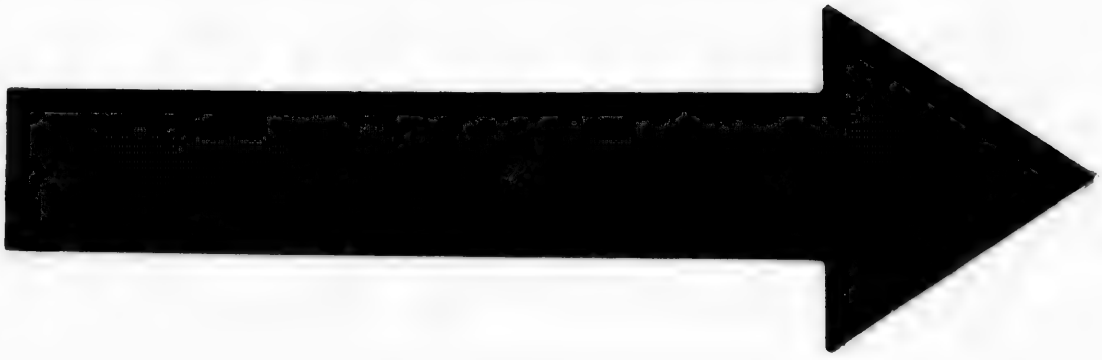
EXPLANATION OF THE PLATE.

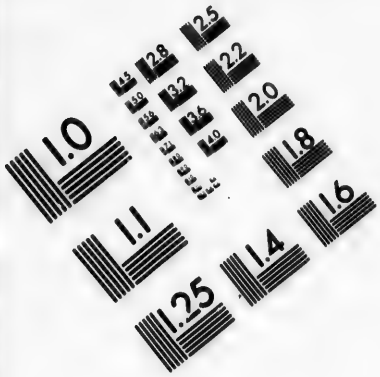
PLATE CX. EYSENHARDTIA ORTHOCARPA.

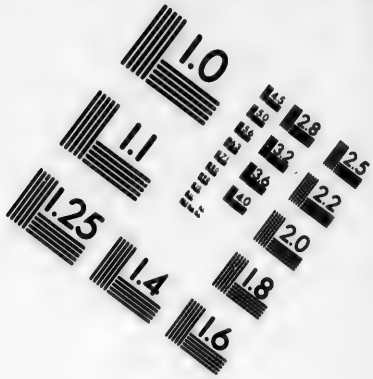
1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. The petals of a flower displayed, enlarged.
5. A flower, the corolla and a portion of the calyx removed, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. Vertical section of a legume, enlarged.
11. A seed, enlarged.
12. An embryo, much magnified.











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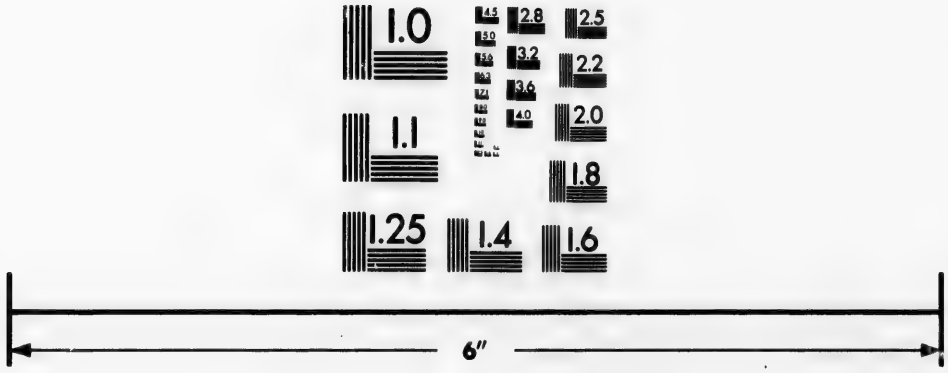

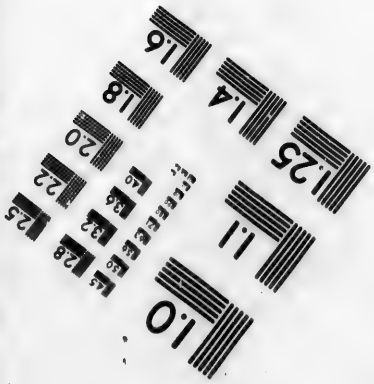

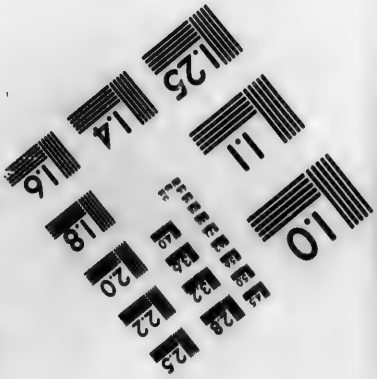

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DALEA.

Flowers in pedunculate spikes or racemes; calyx 5-toothed; standard cordate with a free claw; claws of the wings and keel-petals adnate to the staminal tube; ovary 2 or rarely 3, sometimes 4 to 6-ovuled. Legume ovate, compressed, generally indehiscent. Seed subreniform, usually solitary. Leaves most often unequally pinnate.

Dalea, Linnæus, *Gen.* 349. — Meisner, *Gen.* 89. — Endlicher, *Gen.* 1270. — Bentham & Hooker, *Gen.* i. 493. — Baillon, *Hist. Pl.* ii. 285.
Parosella, Cavanilles, *Elench. Hort. Matrit.*
Cylipogon, Rafinesque, *Jour. Phys.* lxxxix. 97.
Trichopodium, Presl, *Bot. Bemerk.* 52.
Asagræa, Baillon, *Adansonia*, ix. 232; *Hist. Pl.* ii. 288 (not Lindley).

Glandular-punctate herbs, small shrubs, or rarely trees. Leaves alternate, unequally pinnate, rarely digitately three-foliate or simple; stipules generally minute, subulate, deciduous; leaflets small, entire, often stipellate. Flowers purple, blue, white, or rarely yellow, usually sessile, in loose pedunculate spikes or racemes, terminal or opposite the leaves. Bracts membranaceous or setaceous, broad, concave above, glandular-punctate. Calyx five-toothed or lobed, the divisions nearly equal, often accrescent after anthesis, then sometimes plumose, persistent. Corolla papilionaceous; petals unguiculate; standard cordate, free, inserted in the bottom of a tubular disk connate to the calyx-tube, rather shorter than the wings and keel with claws adnate to and jointed upon the staminal tube. Stamens ten or sometimes nine through the suppression of the superior one, monadelphous, united into a tube cleft above and cup-shaped towards the base; anthers uniform, attached on the back near the base, often surmounted with a gland, two-celled, the cells opening longitudinally. Ovary sessile or short-stalked, contracted into a slender subulate style with a minute terminal stigma rarely slightly dilated; ovules usually two, sometimes three, seldom four to six, attached to the interior angle of the ovary, superposed, amphitropous, the micropyle superior. Legume ovate, sometimes conspicuously ribbed, more or less inclosed in the calyx, membranaceous, most often indehiscent, one-seeded. Seed oblong or reniform, destitute of albumen; testa coriaceous. Embryo filling the cavity of the seed; cotyledons broad and flat; the radicle superior, accumbently inflexed.

The genus Dalea is confined to the New World. Nearly a hundred species have been described.[1] More than half are Mexican and tropical and Central American;[2] one species occurs in Chile,[3] ten in the Andes of Peru,[4] and two in the Galapagos Islands;[5] the remainder belong to the central, western, and southwestern regions of the United States.[6] Many of the species are herbs, and others are low undershrubs; but in the arid region of the extreme southwestern territory of the United States individuals of a peculiar group[7] of these plants grow to a considerable size, and among them is one which occasionally assumes the habit and attains the size of a small tree.[8]

[1] De Candolle, *Prodr.* ii. 244. — Walpers, *Rep.* i. 652; ii. 855; v. 513; *Ann.* i. 228; ii. 359; iv. 482.

[2] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 480. — Martens & Galeotti, *Bull. Acad. Brux.* x. pt. ii. 41. — Schlechtendal, *Linnæa*, xii. 200. — Hemsley, *Bot. Biol. Am. Cent.* i. 236.

[3] C. Gay, *Fl. Chil.* ii. 87 (Psoralea).

[4] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 484. — De Candolle, *Prodr.* ii. 247. — Jameson, *Syn. Pl. Æquator.* i. 147.

[5] Hooker f. *Trans. Linn. Soc.* xx. 225, 226. — Andersson, *Stockh. Acad. Handl.* 1853, 109 (*Om Galapagos-Öarnes Veg.*).

[6] Torrey & Gray, *Fl. N. Am.* i. 307. — Brewer & Watson, *Bot. Cal.* i. 141. — Coulter, *Man. Rocky Mt. Bot.* 57; *Contrib. U. S. Nat. Herb.* i. 77 (*Man. Pl. W. Texas*). — Watson & Coulter, *Gray's Man.* ed. 6, 132.

[7] Xylodalea, Brewer & Watson, *l. c.*

[8] *Dalea arborescens* (Torrey, *Mem. Am. Acad.* n. ser. v. 316 [Gray, *Pl. Thurber.*]. — Brewer & Watson, *l. c.*) was discovered by Frémont at the eastern base of the San Fernando Mountains in southern California during his second transcontinental journey, and was described by him as "a small tree." All attempts, however,

None of the species is known to possess properties useful to man, although several are cultivated for the beauty of their flowers.[1]

The genus was dedicated by Linnæus[2] to Dr. Samuel Dale,[3] an English botanist and writer on the materia medica.

to find an arborescent Dalea in this region have proved unsuccessful, although this species has recently been noticed on the Mohave Desert growing as a low shrub.

[1] Ventenat, *Jard. Cels*, 40, t. 40. — Hooker, *Exot. Fl.* t. 43; *Bot. Mag.* t. 2486. — Nicholson, *Dict. Gard.*

[2] *Hort. Cliff.* 363, t. 22.

[3] Samuel Dale (1659–1739), an English apothecary and physician of Boking, is best known by his *Pharmacologia seu Manuductio ad Materiam Medicam*, published in 1693. Several editions of this work appeared, and a supplement in 1705. It was considered in its time one of the most rational books that had been written on the subject. Dale also wrote a History of Harwich (1730), and between 1692 and 1736 made numerous communications to the Royal Society, of which he was a member, including in a letter to Sir Hans Sloane, *Descriptions of the Moose Deer and a sort of Stag in Virginia, with remarks on the Flying Squirrel of America.* He practiced his profession at Braintree in Essex for many years, and was the neighbor and friend of Ray, whose executor he became. His herbarium, bequeathed to the Apothecaries' Company, is now preserved in the British Museum.

DALEA SPINOSA.

FLOWERS loosely racemose; calyx 10-ribbed, conspicuously glandular; petals adnate to the staminal tube by their bases only. Legume exserted from the calyx for half its length; ovules 4 to 6.

Dalea spinosa, Gray, *Mem. Am. Acad.* n. ser. v. 315 (*Pl. Thurber.*); *Ives' Rep.* 10. — Torrey, *Pacific R. R. Rep.* iv. 78; vii. pt. iii. 9, t. 3; *Bot. Mex. Bound. Surv.* 53. — Walpers, *Ann.* iv. 485. — Watson, *Proc. Am. Acad.* xi. 132. — Brewer & Watson, *Bot. Cal.* i. 143. — Hemsley, *Bot. Biol. Am. Cent.* i. 247. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 148 (*Pl. Baja Cal.*).

Asagræa spinosa, Baillon, *Adansonia*, ix. 232; *Hist. Pl.* ii. 288.

A small spinose tree, occasionally eighteen or twenty feet high, with a short stout contorted trunk sometimes twenty inches in diameter and divided near the ground into several upright branches; or more often a low rigid intricately branched shrub. The bark of the trunk is dark gray-brown, nearly a quarter of an inch thick, deeply furrowed, and roughened on the surface with small persistent scales. The branchlets are reduced to slender sharp spines coated with fine hoary pubescence, bearing minute nearly triangular scarious caducous bracts, and marked by occasional glandular fistules. These ultimate branchlets are developed from stouter ones also covered when young with hoary pubescence, but glabrous in their third year, with pale brown bark roughened with lenticels which as it exfoliates shows a pale green inner bark. The leaves are few and irregularly scattered near the base of the spinose branchlets; they are cuneate or linear-oblong, sessile or nearly so, and marked by a few large glands, especially on the margins, which are entire, wavy, or, on vigorous young shoots or seedling plants, remotely and coarsely serrate; they are hoary-pubescent, three quarters of an inch to an inch in length, and an eighth of an inch to half an inch in width, with a broad midrib and three pairs of lateral ribs, and are very deciduous, remaining only for a few weeks on the branches. The stipules are minute, ovate, and acute, and resemble the leaves and branchlets in their pubescent covering. The flowers are produced in June in racemes an inch or an inch and a half long, with slender spinescent hoary-pubescent rachises; they are nearly half an inch long and are borne on short pedicels developed from the axils of minute bracts. The calyx-tube is ten-ribbed and marked with about five glands between the dorsal ribs; the lobes are short, ovate, rounded or more or less ciliate on the margins, and reflexed at maturity. The petals are dark violet-blue; the standard is cordate, reflexed, and furnished at the base of the blade with two conspicuous glands; the wings and keel are attached to the staminal tube by their bases only and are almost equal in size, rounded at the apex, and more or less irregular at the base by a deep lobe. The ovary, which is pubescent and glandular-punctate, develops into a one-seeded pubescent ovate compressed pod twice as long as the calyx and tipped with the remnants of the recurved style. The seed is reniform and an eighth of an inch long, with a lustrous pale brown coat irregularly marked with darker spots.

Dalea spinosa inhabits the Colorado Desert of California, where it occurs at Agua Caliente, Toras, and in a few other localities, and extends eastward to the valley of the lower Gila River in Arizona and the adjacent parts of Sonora, and to Calamujuet in Lower California.[1]

The wood of *Dalea spinosa* is light, soft, and rather coarse-grained, with many evenly distributed open ducts and numerous thin medullary rays. It is walnut-brown in color, with nearly white sapwood composed of twelve to fifteen layers of annual growth. The specific gravity of the absolutely dry wood is 0.5536, a cubic foot weighing 34.50 pounds.

[1] Where it was collected by T. S. Brandegee.

Dalea spinosa was first gathered by Frémont in 1849, but his specimen showed neither flowers nor fruit, and the species was first described from the specimens collected in 1852 on the Colorado Desert by Dr. George Thurber,[1] the botanist of the United States and Mexican Boundary Survey Commission.

[1] George Thurber (1821-1890) was born in Providence, Rhode Island, where he was educated and for several years practiced his profession of apothecary. Through the influence of Dr. John Torrey he was appointed in 1850 botanist to the United States Commission to establish the boundary line between our territory and that of Mexico; and to his scientific duties in connection with the survey were added those of quartermaster and commissary. Dr. Thurber devoted five years to exploring the natural resources of the boundary region from the shores of the Gulf of Mexico to those of the Pacific Ocean, discovering many interesting plants, including a few trees. The most important of these discoveries were described by Professor Asa Gray in the Memoirs of the American Academy (*Plantæ Thurberianæ*). Thurber, on the completion of his duties in connection with the survey, settled in New York, where he was employed in the United States Assay Office, and later became a lecturer before the Cooper Union and in the New York College of Pharmacy. In 1859 he was appointed professor of botany and horticulture in the Agricultural College of Michigan, retaining his chair until 1863, when he became editor of the *American Agriculturist*, a position which he held until within a short time of his death. He was a most accomplished and successful writer on all matters pertaining to horticulture and related subjects, and exerted a wide and always wholesome influence through his own writings and through the improvement which his editorial example produced in the character and scope of the agricultural and horticultural journals of the United States. A Malvaceous plant of the Mexican boundary, named by Gray *Thurberia* in honor of the discoverer, is now referred to *Gossypium*, but *Thurberia*, a genus of American grasses, plants to which he devoted years of study, and which he knew better than any of his contemporaries, keeps green the memory of a learned and interesting man.

EXPLANATION OF THE PLATE.

PLATE CXI. DALEA SPINOSA.

1. A flowering branch, natural size.
2. Portion of a seedling plant showing serrate leaves, natural size.
3. Diagram of a flower.
4. A flower, enlarged.
5. The petals of a flower, displayed, enlarged.
6. Vertical section of a flower, the corolla removed, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. A fruit, enlarged.
11. Vertical section of a fruit, enlarged.
12. A seed, enlarged.
13. Vertical section of a seed, enlarged.
14. An embryo, much magnified.

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EXPLANATION OF THE PLATE

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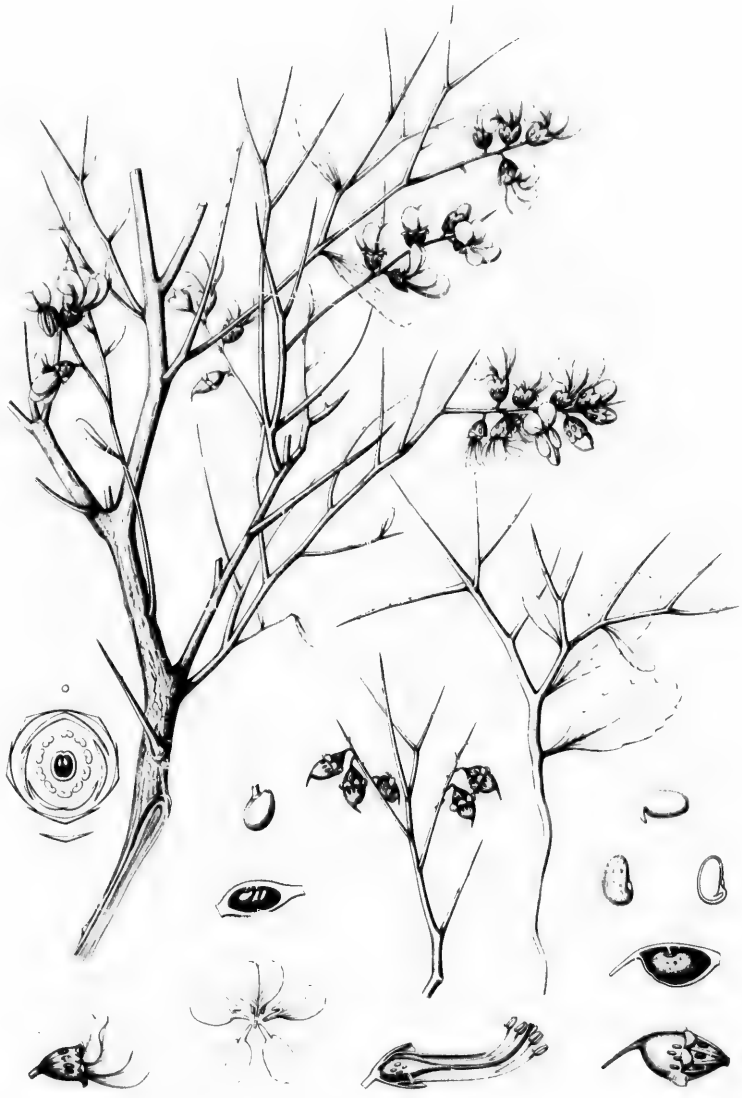

DALEA SPINOSA

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ROBINIA.

FLOWERS in drooping axillary racemes; calyx 5-lobed, the upper lobes subconnate; standard large, reflexed, barely longer than the wings and keel; ovary stipitate, many-ovuled. Legume linear, compressed, 2-valved. Leaves unequally pinnate.

Robinia, Linnæus, *Gen.* 220. — Adanson, *Fam. Pl.* ii. 323. — A. L. de Jussieu, *Gen.* 358. — De Candolle, *Mém. Légum.* 273. — Endlicher, *Gen.* 1274. — Meisner, *Gen.* 89. — Bentham & Hooker, *Gen.* i. 499. — Baillon, *Hist. Pl.* ii. 267.

Trees or rarely shrubs, spreading by underground shoots, with slender terete or slightly many-angled zigzag branchlets of indefinite growth. Buds minute, naked, subpetiolar, three or four together, superposed, protected collectively in a depression by a scale-like covering lined on the inner surface with a thick coat of tomentum and opening in early spring, its divisions persistent through the season on the base of the branchlet developed usually from the upper bud.[1] Leaves unequally pinnate, deciduous; leaflets oval, entire, petiolulate, reticulate, penniveined, stipellate; stipules setaceous, becoming spinescent at maturity, persistent. Flowers long-pedicellate in short pendulous racemes developed from the axils of the leaves of the year. Bracts and bractlets small, acuminate, early deciduous. Calyx campanulate, five-toothed, or cut, the upper lobes shorter than the others, cohering for a part of their length and valvate in æstivation. Corolla papilionaceous; petals shortly unguiculate, inserted on a tubular disk glandular on the inner surface and connate with the base of the calyx-tube; standard ample, naked on the inner surface, obcordate, reflexed; wings oblong-falcate, free; keel-petals valvate in æstivation, incurved, obtuse, united below. Stamens ten, inserted with the petals, diadelphous; the nine inferior united into a tube often enlarged at the base and cleft on the upper side, the superior one free at the base and connate in the middle with the staminal tube, or finally free; anthers similar, or those opposite the petals sometimes rather smaller, ovate, attached on the back near the base, two-celled, the cells opening longitudinally. Ovary linear-oblong, stipitate; style subulate, inflexed, bearded along the inner side near the apex; stigma terminal, small; ovules suspended from the interior angle of the ovary, two-ranked, superposed, amphitropous, the micropyle superior. Legume many-seeded, linear-compressed, almost sessile, two-valved, the seed-bearing suture narrow-winged; valves thin and membranaceous. Seed oblong-oblique, transverse, estrophiolate, attached by a stout persistent incurved funiculus enlarged at the point of attachment to the placenta; testa thin, crustaceous; albumen thin, membranaceous. Embryo large; cotyledons oval, fleshy; radicle short, much reflexed, accumbent.

The genus Robinia is North American. Four species inhabit the territory of the United States; and two, or possibly more, very imperfectly known, occur in Mexico.[2] Robinia was once more widely distributed over the earth's surface, and the traces of its presence in the Old World are found in the Cretaceous and Eocene rocks of central Europe, where analogues of existing forms abound.[3] Of the species of our territory three are arborescent and one is shrubby.[4]

[1] The subpetiolar buds are often accompanied by a supplementary supra-axillary bud which sometimes develops late in the season into a feeble branchlet which apparently does not survive the first winter.

[2] Schlechtendal, *Linnæa*, xii. 305, 306. — Hemsley, *Bot. Biol. Am. Cent.* i. 259.

[3] Saporta, *Origine Paléontologique des Arbres*, 312.

[4] *Robinia hispida*, Linnæus, *Mant.* 101. — Schmidt, *Oestr. Baum.* i. 36, t. 31. — *Bot. Mag.* t. 311. — De Candolle, *Prodr.* ii. 262. — Guimpel, Otto & Hayne, *Abbild. Holz.* 83, t. 66. — Torrey & Gray, *Fl. N. Am.* i. 295. — Watson & Coulter, *Gray's Man.* ed. 6, 134.

One of the species produces hard, durable, and very valuable timber, and its bark, especially that of the roots, possesses tonic and emetic properties. All the species of the United States are valued as ornamental plants and are largely cultivated for the beauty of their flowers. Many insects feed upon Robinia,[1] which is also affected, although not very seriously, by fungal diseases.[2]

The generic name made by Linnæus, who discarded that of Tournefort, Pseudacacia,[3] commemorates the botanical labors of Jean Robin,[4] herbalist of the king of France, and of his son, Vespasien Robin.[5]

[1] The most serious enemy of the Robinia is a borer (*Cyllene robiniæ*, Forster) which riddles the trunk and in many parts of the country has destroyed the value of *Robinia Pseudacacia* as a timber tree. The different species are injured by another borer (*Cossus robiniæ*, Harris) which, however, generally does more damage to the Oak. The boring larva of a moth (*Scapteron robiniæ*, H. Edwards) is said to destroy *Robinia Pseudacacia* in some parts of Nevada and California (*Bull. Brooklyn Entomolog. Soc.* iii. 72).

The foliage of Robinia is attacked by several insects, one of the most common and generally distributed being a butterfly (*Eudamus tityrus*, Fab.). The larvæ of a small moth (*Depressaria robiniella*, Packard) draw the leaves together and devour them (*Bull. No. 7, U. S. Entomolog. Com.* 98), and they are eaten by several species of leaf-miners, one of the most destructive of which is a small beetle (*Odontota dorsalis*, Thunb.). The larvæ of a small saw-fly (*Nematus similaris*, Norton) feed on the leaves; and the genus is not exempt from the attacks of the Clisiocampas and other insects which are found on many of our forest trees. Small caterpillars are occasionally found in the pods, and the seed is often devoured by weevils.

[2] Robinia, in common with other arborescent *Leguminosæ* of North America, is affected by only a few diseases which can be traced directly to the action of fungi, and these are not especially dangerous. They are caused by species like *Aglaospora profusa*, De Not., *Valsa ceratophora*, Tul., and others found on many woody plants; while a few like *Valsaria Robiniæ*, Cooke, *Sphæronema Robiniæ*, B. & C., and *Sporocybe Robiniæ*, Fr., are considered peculiar to the genus. These are all small black fungi whose characters are not to be recognized without the aid of the microscope.

[3] *Inst.* 649, t. 417.

[4] Jean Robin (1550–1629), a Parisian apothecary whom Tournefort called the most distinguished botanist of his time, established a garden near the Louvre which soon became famous. About 1586 he was made arborist and herbalist of Henry III. and was appointed director of the gardens of the Louvre, a position which he continued to fill under Henry IV. and Louis XIII. In 1597 he laid out and planted the garden of the Faculty of Medicine of Paris, into which he introduced a number of valuable plants, including *Hibiscus Syriacus* and the Tuberose, which before his time was only known in France in the gardens of Provence and Languedoc, but which he made popular at the north. His published works include descriptions of new plants from Spain and Guinea published in his *Jardin de Louis XIII.* and catalogues of the plants which he cultivated. In 1601 these numbered 1371 species, and in 1624 had increased to 1800 as described in his *Enchiridion Inagogicum* published in that year.

[5] Vespasien Robin (1579–1660) was early associated with his father, whom he succeeded as king's arborist. The younger Robin made a number of journeys in the south of France and among the Alps and Pyrenees and into Spain and the Barbary States for the purpose of collecting plants for the Jardin du Roi, in which, in 1635, he was made assistant professor of botany, becoming professor at the death of Gui de Labrosse. In 1653 he was replaced in this position by Dionys Joncquet, although until his death he retained the honorary title of lecturer upon medical plants. He was associated with his father in the publication of the *Enchiridion*.

CONSPECTUS OF THE SPECIES OF THE UNITED STATES.

Flowers in slender loose racemes; legume smooth; branches naked	1. R. PSEUDACACIA.
Flowers in short crowded glandular-hispid racemes; legume glandular-hispid; branches naked	2. R. NEO-MEXICANA.
Flowers in crowded oblong racemes; legume glandular-hispid; branches and petioles clammy	3. R. VISCOSA.
Flowers in short crowded racemes; legume glandular-hispid; branches and petioles bristly-pubescent (shrubby)	4. R. HISPIDA.

ROBINIA PSEUDACACIA.

Locust. Acacia. Yellow Locust.

Flowers white, in slender loose racemes. Legume smooth. Branches naked.

Robinia Pseudacacia. Linnæus, *Spec.* 722. — Miller, *Dict.* ed. 8, No. 1. — Du Roi, *Harbk. Baum.* ii. 320. — Marshall, *Arbust. Am.* 133. — Wangenheim, *Nordam. Holz.* 16, t. 7. — Castiglioni, *Viag. negli Stati Uniti*, ii. 367. — L'Heritier, *Stirp. Nov.* 158. — Schmidt, *Oestr. Baum.* i. 31, t. 32. — Walter, *Fl. Car.* 186. — Gærtner, *Fruct.* ii. 307, t. 145. — Willdenow, *Spec.* iii. 1131; *Enum.* 769; *Berl. Baumz* 372. — Schoellenbach, *Abbild. Bäume*, ii. 67, t. 42. — Michaux, *Fl. Bor.-Am.* ii. 65. — *Nouveau Duhamel*, ii. 60, t. 16. — Poiret, *Lam. Dict.* vi. 222; *Ill.* iii. 163, t. 606. — Persoon, *Syn.* ii. 311. — Desfontaines, *Hist. Arb.* ii. 302. — Michaux f. *Hist. Arb. Am.* iii. 245, t. 1. — Pursh, *Fl. Am. Sept.* ii. 487. — Nuttall, *Gen.* ii. 118. — Hayne, *Dendr. Fl.* 140. — Elliott, *Sk.* ii. 242. — Jaume St. Hilaire, *Traité des Arbres*, t. 71. — De Candolle, *Prodr.* ii. 261. — Sprengel, *Syst.* iii. 247. — Torrey, *Fl. N. Y.* i. 165. — Hooker, *Fl. Bor.-Am.* i. 140. — Audubon, *Birds*, t. 104. — Don, *Gen. Syst.* ii. 237. — Spach, *Hist. Vég.* i. 258. — Torrey & Gray, *Fl. N. Am.* i. 294. — Bigelow, *Fl. Boston.* ed. 3, 295. — Dietrich, *Syn.* iv. 1053. — Darlington, *Fl. Cestr.* ed. 3, 63. — Chapman, *Fl.* 94. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 48. — Baillon, *Hist. Pl.* ii. 209, f. 159. — Koch, *Dendr.* i. 55. — Emerson, *Trees Mass.* ed. 2, ii. 523, t. — Willkomm, *Forst. Fl.* ed. 2, 930. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 65. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Watson & Coulter, *Gray's Man.* ed. 6, 134.

Pseudacacia odorata. Moench, *Meth.* 145.

R. fragilis. Salisbury, *Prodr.* 336.

A tree, seventy to eighty feet in height, with a trunk three or four feet in diameter, and slender brittle usually erect branches which form a narrow oblong head. The bark of the trunk on fully grown individuals varies from an inch to an inch and a half in thickness; it is deeply furrowed and dark brown tinged with red, the surface being broken into small square persistent scales. The branchlets, which are terete or sometimes slightly many-angled, especially on vigorously growing plants, are marked with small pale scattered lenticels, and when they appear are coated with short appressed silvery white pubescence. This soon wears off, and during their first season they are pale green and puberulous, turning light reddish brown towards autumn, when they are glabrous or nearly so. The leaves when they unfold are covered with silvery pubescence, which, however, soon disappears: they are composed of seven to nineteen leaflets, and vary from eight to fourteen inches in length, with slender puberulous petioles which are grooved on the upper side and swollen at the base. The stipules are half an inch long, linear, subulate, membranaceous at first, coated with pubescence, and tipped with a small tuft of caducous brown hairs; ultimately they develop into hard woody straight or slightly recurved spines, which do not disappear for many years and increase in size with the growth of the branches until they are sometimes more than an inch long.[1] The leaflets are ovate, rounded or slightly truncate and minutely apiculate at the apex, very thin, dull dark blue-green on the upper, and pale on the lower surface, and glabrous at maturity with the exception of the slight puberulence which covers the under side of the slender midribs; they are an inch and a half to two inches long, and half an inch to three quarters of an inch broad, and are borne on stout petiolules an eighth of an inch to a quarter of an inch in length. The stipels are minute, linear, membranaceous, and early deciduous. The leaves turn pale clear yellow late in the autumn, just before falling. The flowers, which open late in May or early in June, are produced in loose puberulous racemes four or five inches long; they are nearly an inch in

[1] The stipules of *Robinia Pseudacacia* appear to be more developed on the lower than on the upper branches, and this fact leads Sir John Lubbock to suppose that they serve to protect the young growing branches presumably from herbivorous animals, while in the other species this protection is afforded by bristly hairs or by the gummy substance which exudes from the small globose glands that cover the branches of *R. viscosa*, a species also provided, however, with spiny stipules. (*Jour. Linn. Soc.* xxviii. 228.)

length and are filled with nectar and very fragrant. The pedicels, developed from the axils of minute caducous bractlets, are slender, half an inch long, and dark red or red tinged with green. The calyx is conspicuously gibbous on the upper side, pilose within and without, ciliate on the margin, and dark green blotched with red, especially on the upper side; the lower lobe is acuminate and much longer than the triangular lateral lobes; the upper divisions are short and nearly triangular. The petals are pure white with the exception of the large pale yellow blotch which marks the inner surface of the standard. The fruit, which attains nearly its full size by the end of July, ripens late in the autumn and hangs on the branches until the end of winter or the beginning of spring. It is borne in stout thick-stemmed racemes, and is three or four inches long and half an inch broad, with bright red-brown valves, and is usually four to eight-seeded. The seeds are three sixteenths of an inch long, and dark orange-brown with irregular darker markings.

Robinia Pseudacacia naturally inhabits the slopes of the Apalachian Mountains from Locust Ridge in Marion County, Pennsylvania, to northern Georgia; it has become widely naturalized in most of the territory of the United States east of the Rocky Mountains, and is perhaps indigenous on Crowley's Ridge in northeastern Arkansas and in some parts of western Arkansas and of eastern Indian Territory.[1] In its native forests the Locust is nowhere common and does not occupy the ground exclusively, but mingles singly or in groups of two or three with the Hickory, the Black Walnut, the Ash, the White Oak, the Cucumber Magnolia, and other trees which thrive in the deep rich soil in which the Locust grows to its largest size and produces its most valuable timber. It is most common and attains its best development on the western slopes of the mountains of West Virginia. In less favorable situations and at lower elevations, especially on gravelly soil, it spreads by underground stems into broad thickets of small and often stunted trees, and is now common in many parts of the northern and eastern states.

Robinia Pseudacacia is one of the most valuable timber-trees of the American forest. The wood is heavy, exceedingly hard and strong, close-grained, and very durable in contact with the ground. It is brown or more rarely light green with pale yellow sapwood composed of two or three layers of annual growth only; it contains numerous obscure medullary rays, the layers of annual growth being clearly marked by two or three rows of large open ducts. The specific gravity of the absolutely dry wood is 0.7333, a cubic foot weighing 45.70 pounds. It is extensively used in shipbuilding,[2] for all sorts of posts, and other purposes where durability in contact with the ground is sought, in construction and in turnery. It is preferred to the wood of any other North American tree for treenails, and was once largely exported in this form; and it is excellent fuel, burning slowly with a clear bright flame.[3]

[1] Engelmann, who explored this region fifty years ago and before it had been invaded by settlers, through whose agency *Robinia Pseudacacia* has become so widely scattered in the United States, first noticed it west of the Mississippi River growing, as he always believed, indigenously. In the trans-Mississippi region it does not, except in cultivation, attain a large size, and is usually a low shrub.

It is probable that the Indians of Virginia, who knew the value of the wood of the Locust and made their bows from it, carried the tree from the mountains into the low country, and so helped to spread it beyond the limits of its native forests. It appears to have been common in the neighborhood of the coast when Virginia was first settled by Europeans. William Strachey, who visited the colony on James River in 1610 and printed the first mention of this tree, found that "by the dwellings of the salvages are bay-trees, wild roses and a kynd of low tree, which beares a cod like to the peas, but nothing so big: we take yt to be locust." (*Historie of Travaile into Virginia Britannia*, ed. Major, 130.) The Indians, he tells us, made "their bows of some plant, eyther of the locust-tree or of weech." (*Ibid.* 105.)

The English in Virginia soon learned the value of Locust timber, for, "being obliged to run up with all the expedition possible such little houses as might serve them to dwell in, till they could find leisure to build larger and more convenient ones, they erected each of their little hovels on four only of these trees (the Locust-tree of Virginia), pitched into the ground to support the four corners: many of these posts are yet standing, and not only the parts underground, but likewise those above, still perfectly sound." (Mark Catesby, *Hortus Britanno-Americanus*, 34. London, 1763.)

[2] Mr. Ebenezer Jessup, writing to the *Gentleman's Magazine* in 1791, proposed a scheme for planting the Locust on a large scale in the New Forest with the idea of supplying the British navy with timber, its value in shipbuilding being well established at this time. (lxi. 699.) Locust treenails, according to Loudon (*Arb. Brit.* ii. 619), sold in Philadelphia, in 1819, at ten dollars a thousand, and fifty to one hundred thousand were annually exported from that city alone to England.

[3] Mathieu, *Flore Forestière*, ed. 3, 108.

The bark of the root is tonic, or in large doses purgative and emetic,[1] and is used in homœopathic remedies.[2]

Robinia Pseudacacia was introduced into Europe early in the seventeenth century,[3] and was planted in the Jardin du Roi in Paris by Vespasien Robin in 1636.[4] The first description of the tree was published by John Parkinson in 1640 in the *Theatrum Botanicum*.[5]

No other North American tree has been so generally planted for timber and ornament in the United States[6] and in Europe;[7] and no inhabitant of the American forest has been the subject of so voluminous a literature.[8] Numerous varieties have appeared in nurseries marked by peculiarities of foliage, of habit, and of the color of the flowers, and are esteemed wherever the Robinia can be successfully grown.[9]

[1] Griffith, *Med. Bot.* 238, f. 123.—*U. S. Dispens.* ed. 14, 1746. — *Nat. Dispens.* ed. 2, 1231. — Lawrence Johnson, *Man. Med. Bot. N. Am.* 132.

[2] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 50, t. 50.

[3] It is impossible to establish the exact date of the introduction of the Locust-tree into Europe. Some authors, including Linnæus, the editors of the last edition of *Miller's Dictionary*, and those of the *Nouveau Duhamel*, fix it as 1601 when Jean Robin is said to have obtained seeds from America: others, including Adanson and Deleuze, state that it was not until 1636 that the Locust reached Paris, and that the honor of its introduction belongs to Vespasien and not to Jean Robin. It is not improbable that the Locust may have been cultivated in England as early or earlier than in France. According to Parkinson, whose work was published only five years after Vespasien Robin planted his tree in Paris, the Locust had been raised near London by Tradescant "to an exceeding great height."

[4] The tree planted by Vespasien Robin in Paris in 1636 is still living in the gardens of the Museum d'Histoire Naturelle. (See *Revue Horticole*, 1873, 152, f. 16. — *Garden and Forest*, iii. 305, f.)

[5] *Arbor siliquosa Virginiensis spinosa, Locus nostratibus dicta*, 1550.

Acacia Virginiana siliquis glabris, Ray, *Hist. Pl.* ii. 1719.

Acaciæ affinis Virginiana spinosa, siliqua membranacea plana, floribus albis papilionaceis. Anagyridis modo in Uvam propendentibus, Plukenet, *Phyt.* t. 73, f. 4; *Alm. Bot.* 6.

Pseudo-Acacia siliquis glabris, Boerhaave, *Hort. Lugd. Bat.* ii. 39.

Robinia aculeis geminatis, Linnæus, *Hort. Cliff.* 354. — Royen, *Fl. Leyd. Prodr.* 372. — Clayton, *Fl. Virgin.* 82.

Robinia pedunculis racemosis, foliis pinnatis, Linnæus, *Hort. Ups.* 212. — Clayton, *Fl. Virgin.* ed. 2, 105.

[6] The value of *Robinia Pseudacacia* is practically destroyed in nearly all parts of the United States beyond the mountain forests which are its home, by the borers which riddle the trunk and branches. Were it not for these insects it would be one of the most valuable timber-trees that could be planted in the northern and middle states. The character of the timber which it produces, the rapidity of its growth, its power to adapt itself to different soils and to reproduce itself rapidly by seeds which germinate readily, and by stump and root shoots, would make it a most valuable subject for forest and coppice-planting if it could be protected from insects. Young trees grow quickly and vigorously for a number of years, but soon become stunted and diseased, and rarely live long enough to attain any commercial value.

[7] No other American tree is so common in central and northern Europe, where *Robinia Pseudacacia*, although it never attains the size to which it grows in its native forests, now sometimes springs up spontaneously and appears to be naturalized. It is planted in great numbers for the decoration of parks and gardens, to protect railroad embankments, and to fix shifting sands, in coppice for the production of stakes and poles, and for the fodder furnished by the young growing shoots and leaves. (See a letter on the Acacia as a fodder plant in the *Gentleman's Magazine*, 1801, 1098.)

[8] Evelyn, *Silva*, 64, ed. Hunter, ii. 63. — Miller, *Dict.* No. 1. — Duhamel, *Traité des Arbres*, ii. 187, t. 42. — Aiton, *Hort. Kew.* iii. 53. — Bechstein, *Forstbot.* i. 265. — Naudin, *Manuel de l'Acclimateur*, 467.

Towards the end of the last century public attention in Europe was attracted to the value of the Robinia by a number of papers printed in the Transactions of scientific and horticultural societies; and in 1803 Monsieur N. François de Neufchateau, a senator and member of the Institute, published in Paris, under the title of *Lettre sur le Robinia connu sur le nom impropre de faux Acacia*, an octavo volume of three hundred and fourteen pages containing the essence of all that had been published about the tree in France, with much interesting information relating to its cultivation and its uses. A translation of a large part of this was published in 1842 in an English book on the Locust by W. Withers entitled, *The Acacia-tree: its Growth, Cultivation, and Uses.*

William Cobbett, the publicist, by his example and writings, did more than any one else to make known the value and extend the cultivation of the Locust-tree in the United States and in Europe. During an enforced residence in the United States, between the years 1817 and 1819, Cobbett devoted himself to farming on Long Island, and established a small nursery for the propagation of fruit and timber trees. Here he came to the conclusion "that nothing in the timber line could be so great a benefit as the general cultivation of the Locust." On his return to England he carried with him a package of the seeds and began the systematic raising and selling of Locust-trees, of which he sold more than a million. (See Cobbett, *Woodlands*, No. 323. — Loudon, *Arb. Brit.* ii. 609.)

[9] At least thirty varieties of *Robinia Pseudacacia* are recognized in gardens. The most distinct are, —

Var. *inermis*, De Candolle, *Cat. Hort. Monsp.* 136; *Prodr.* ii. 261. — Loudon, *Arb. Brit.* ii. 609. (*R. spectabilis*, Du Mont de Courset, *Bot. Cult.* vi. 140. *R. Utterhartii*, *Hort.* — Verlot, *Rev. Hort.* 1873, 155.)

This only differs from the common Locust in the absence of stipular spines. It is this form which is usually planted in Europe for fodder. Grafted plants are used for this purpose, as the seedlings are often furnished with spines, which detract from the value of the fodder. Grown in good soil the Robinia furnishes two crops of shoots in the season.

Var. *umbraculifera*, De Candolle, *Cat. Hort. Monsp.* 137; *Prodr. l. c.* — Loudon, *l. c.* 610. — Koch, *Dendr.* i. 57. — Verlot, *l. c.* (*R. inermis*, Du Mont de Courset, *l. c.*)

The Parasol Acacia, as this variety is usually called, is character-

Robinia Pseudacacia is surpassed in beauty by few American trees. In no other are lightness and grace of foliage combined with such massiveness of trunk and spread of branches.[1] Few trees produce more abundant, beautiful, or fragrant flowers, or afford more pleasing contrasts of color in the light green of the youngest leaves with the darker hues of those of the earlier part of the season, and between the different shades of color of the upper and lower surfaces of the leaflets as they rise and fall with the slightest breath of air.[2]

ized by its short unarmed branches which form a compact spherical head. It is grafted either on tall stems of the common Robinia or on its own roots, and, although it does not produce flowers, is one of the most popular trees in the countries of central and northern Europe, where it is much used to decorate city and villa gardens and to shade highways, for which purpose its low wide-spreading head and dense foliage well adapt it. It is also used as a forage plant. (André, *Rev. Hort.* 1863, 347.)

Var. *crispa*, De Candolle, *Prodr.* ii. 261. — Verlot, *Rev. Hort.* 1873, 155.

A form in which the margins of the leaflets, especially those on the upper branches, are more or less undulate or crinkled.

Var. *tortuosa*, De Candolle, *l. c.* — Loudon, *Arb. Brit.* ii. 609. — Koch, *Dendr.* .. 57. — Verlot, *l. c.*

A form distinguished by the abnormal tortuous growth of the branches.

Var. *pyramidalis*, *Hort.* (*R. stricta*, *Hort.* *R. fastigiata*, *Hort.*)

A variety with upright branches forming a narrow pyramidal head which appeared in 1839 in the nursery of Monsieur A. Leroy at Angers. (Verlot, *l. c.*)

Var. *Decaisneana*, Carrière, *Rev. Hort.* 1863, 151, t. — *Fl. des Serres*, xix. t. 2027. — Lemaire, *Ill. Hort.* xii. t. 427. — Verlot, *l. c.*

A vigorous tree distinguished by its rose-colored flowers, which appeared in the nursery of Monsieur Villevelle at Manosque in France, where it flowered for the first time in 1862.

Var. *monophylla*, *Hort.*

A form in which the leaves are sometimes reduced to a single broad leaflet, or more often to two or three. This variety was obtained about 1855 by a French nurseryman, Monsieur Deniaux. (Verlot, *l. c.*)

Other distinct varieties sometimes found in gardens are var. *macrophylla* (Loddiges, *Cat.* 1830. — Loudon, *l. c.*); var. *microphylla* (Loddiges, *l. c.* — Loudon, *l. c.*); var. *pendula*, *Hort.*; var. *dissecta*, *Hort.*; and var. *latisiliqua*, *Hort.*, characterized by its large legumes. (Koch, *l. c.* — Verlot, *l. c.*).

[1] The brittleness of its branches is the only serious drawback to the Locust as an ornamental tree where it escapes the ravages of insects. In exposed situations they are often broken by the wind and the symmetry of the tree is injured. "It may ornament a garden, but is by no means qualified to adorn an exposed country. It depends on its beauty rather than on its grandeur, which is a quality more liable to injury." (Gilpin, *Forest Scenery*, ed. 2, i. 72.)

The Locust is less injurious than many other trees to plants growing under the shade of its branches, owing to the open character of the foliage and the fact that the leaflets fold together in wet weather and so allow the rain quickly to reach the ground beneath. (See Phillips, *Sylva Flor.* i. 47.)

[2] *Robinia Pseudacacia* continues to grow until the beginning of autumn, and the ends of the branches in summer are covered with young light yellow-green leaves which stand out conspicuously against the dark background of the older foliage.

EXPLANATION OF THE PLATES.

Plate CXII. Robinia Pseudacacia.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Front view of a flower, natural size.
4. A staminal tube, enlarged.
5. Vertical section of a pistil, enlarged.
6. An ovule, much magnified.

Plate CXIII. Robinia Pseudacacia.

1. A fruiting branch, natural size.
2. A legume with one of the valves removed, natural size.
3. Vertical section of a seed, enlarged.
4. An embryo, enlarged.
5. A portion of a branch, the petiole removed and the bud covering laid open, showing the superposed naked buds, with a portion of a branchlet developed from a supra-axillary bud, enlarged.
6. A winter branchlet, natural size.

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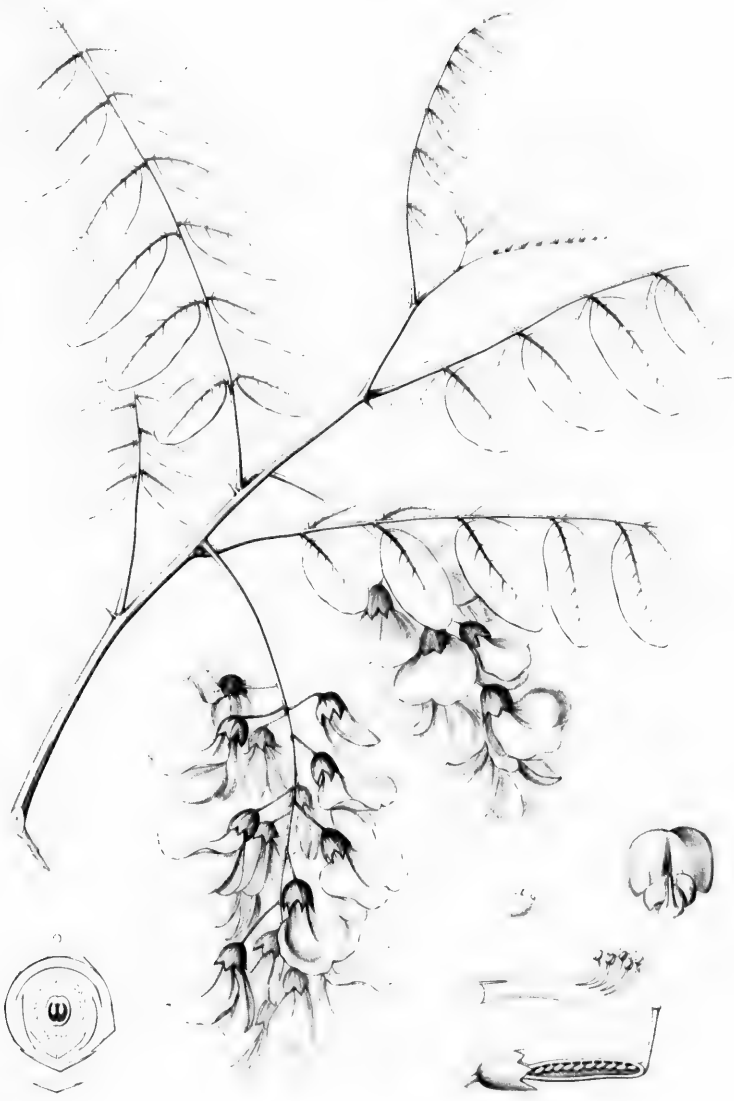

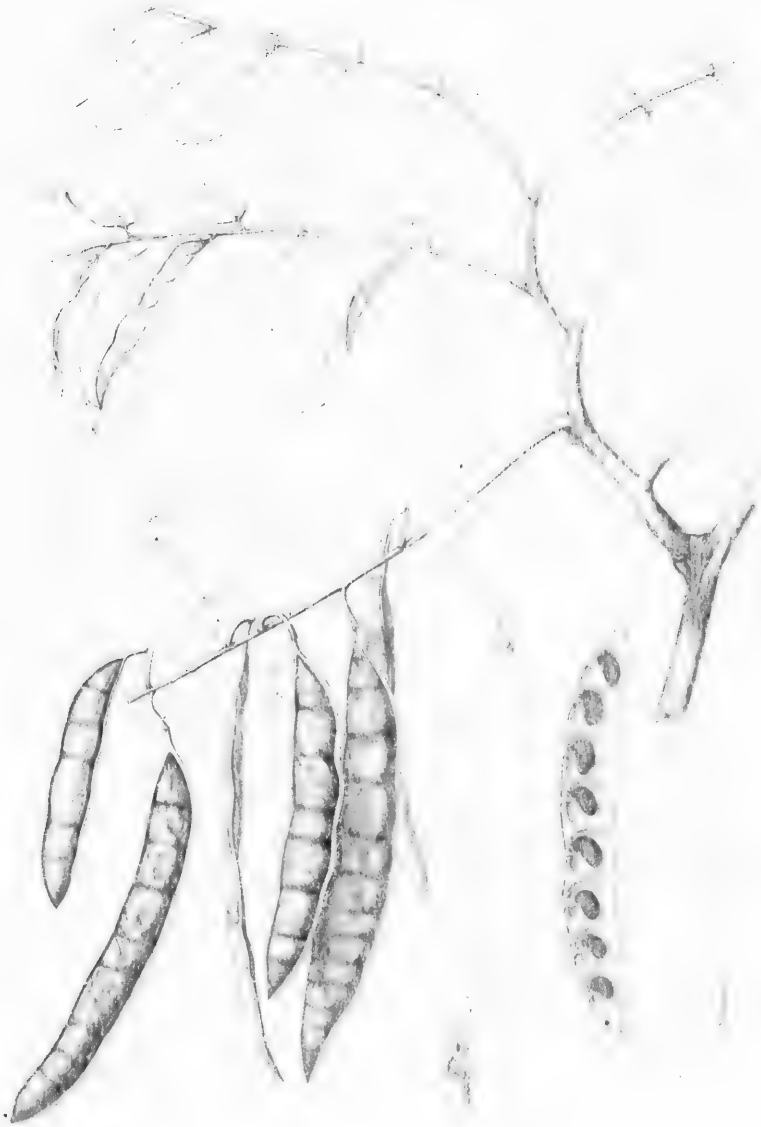

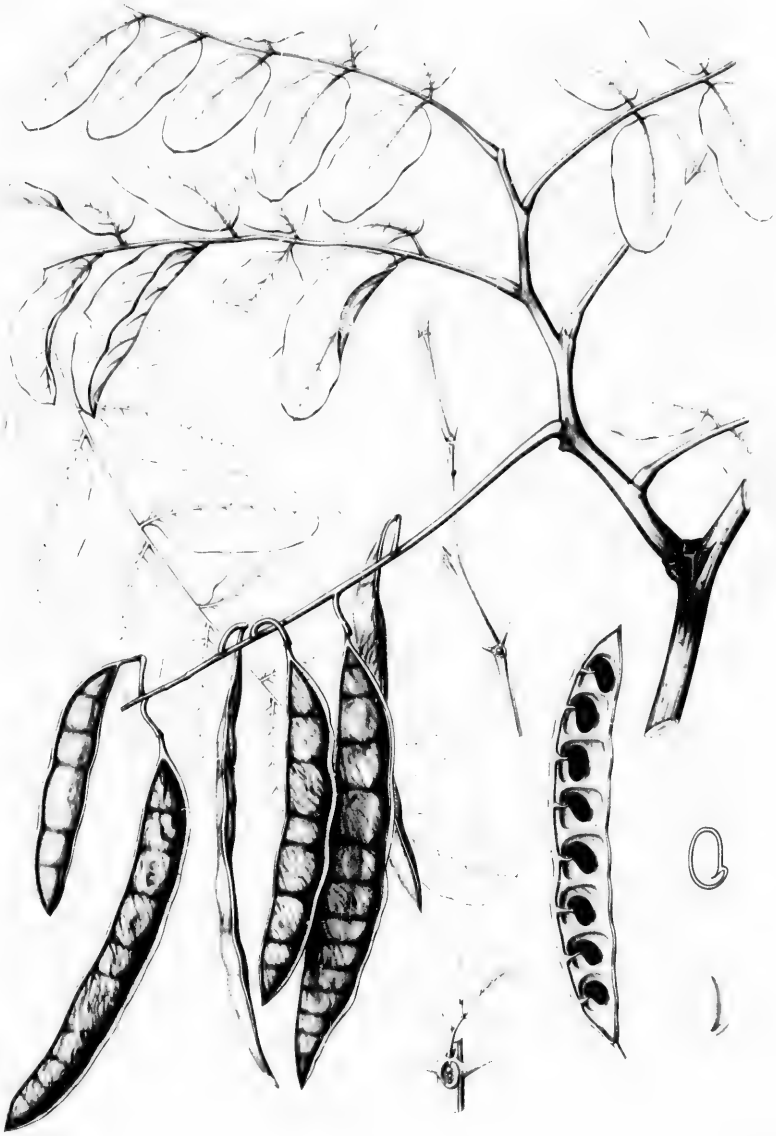

ROBINIA PSEUDACACIA

ROBINIA NEO-MEXICANA.

Locust.

FLOWERS pale rose-colored, in short crowded glandular-hispid racemes. Legume glandular-hispid. Branches naked.

Robinia Neo-Mexicana, Gray, *Mem. Am. Acad.* n. ser. v. 314 (*Pl. Thurber.*). — Torrey, *Pacific R. R. Rep.* iv. 79; *Bot. Mex. Bound. Surv.* 53. — Walpers, *Ann.* iv. 491. — Watson, *King's Rep.* v. 419. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 56. — Coulter, *Man. Rocky Mt. Bot.* 59.

A small tree, sometimes twenty or twenty-five feet in height, with a slender trunk six or eight inches in diameter; or more often a low shrub. The bark of the trunk is thin, slightly furrowed, and light brown, the surface separating into small plate-like scales. The branchlets when they appear are pale and coated with rusty brown glandular hairs which increase in length during the summer and do not disappear until the autumn. In winter the branchlets of the previous season are slightly puberulous, bright reddish brown, often covered with a glaucous bloom, and marked by a few scattered small pale lenticels. The winter-buds are minute, depressed-globular, and protected by a scale-like covering coated with dark brown tomentum. The leaves vary from six to twelve inches in length, and are composed of from fifteen to twenty-one leaflets borne on a stout pubescent petiole grooved on the upper side and enlarged at the base. The leaflets are elliptical-oblong, mucronate, rounded, or sometimes slightly emarginate at the apex, usually wedge-shaped or sometimes rounded at the base, an inch and a half long and an inch broad; at first they are coated on the lower surface and the margins with soft brown hairs, and on the upper surface with silvery white pubescence; and at maturity they are thin, pale blue-green, conspicuously reticulate-veined, with slender midribs and primary veins, and quite glabrous with the exception of the lower side of the midribs and the stout petiolules, which are slightly puberulous. The stipules are chartaceous when they appear, and are covered with long silky brown hairs, which also form a tuft at their apex; at maturity they become stout slightly recurved flat brown or bright red spines sometimes an inch or more in length.[1] The stipels are membranaceous, a quarter of an inch long, often recurved, and sometimes do not disappear until the end of the season. The flowers, which are an inch in length, appear in May in short compact many-flowered glandular-hispid racemes with stout peduncles. The pedicels are slender, half an inch long, and, like the exterior of the calyx, covered with stout glandular hairs. The corolla is pale rose-colored or sometimes almost white, with a broad standard and wing-petals. The legume is three or four inches long with a narrow wing, and is covered with stout glandular hairs and conspicuously tipped with the remnants of the recurved style. The seeds are very dark brown, slightly mottled, and a sixteenth of an inch or rather more in length.

Robinia Neo-Mexicana inhabits the banks of mountain streams from the valley of the Purgatory River in Colorado, through northern New Mexico to the Santa Catalina and the Santa Rita Mountains in Arizona, where it occurs at elevations varying from four thousand to seven thousand feet above the sea-level, and to southern Utah, where it has been found near Kanah and in Mt. Zion Cañon of the west fork of the Rio Virgen. Only in the valley of the Purgatory River near Trinidad in Colorado is it known to grow into a small tree.

The wood of *Robinia Neo-Mexicana* is heavy, exceedingly hard, strong, and close-grained, with a satiny surface; it contains many evenly distributed open ducts and thin conspicuous medullary rays.

[1] The stipular spines of this species, which inhabits an arid region where plants require special protection from browsing animals and are usually well armed against them, are more constantly developed and generally much larger than those of the other Robinias.

It is yellow streaked with brown, with a light yellow sapwood composed of four or five layers of annual growth. The specific gravity of the absolutely dry wood is 0.8034, a cubic foot weighing 50.07 pounds.

Robinia Neo-Mexicana was discovered in May, 1851, by Dr. George Thurber, the botanist of the United States and Mexican Boundary Survey Commission, on a dry hillside in the valley of the Mimbres River in New Mexico, and was introduced into cultivation through the Arnold Arboretum in 1882. It is perfectly hardy in New England, where it grows rapidly and vigorously.[1]

[1] The largest plants in the Arboretum are ten or twelve feet high but have not yet flowered. Dr. G. Dieck reports that the plant in his Arboretum at Zoeschen, in Germany, produced flowers in the spring of 1891 (*Gartenflora*, 1891, 302).

EXPLANATION OF THE PLATE.

PLATE CXIV. ROBINIA NEO-MEXICANA.

1. A flowering branch, natural size.
2. A calyx, enlarged.
3. A flower, the calyx and corolla removed, enlarged.
4. A pistil, enlarged.
5. A raceme of fruit, natural size.
6. A legume with one valve removed, natural size.
7. Vertical section of a seed, enlarged.
8. An embryo, much magnified.
9. A winter branchlet, natural size.

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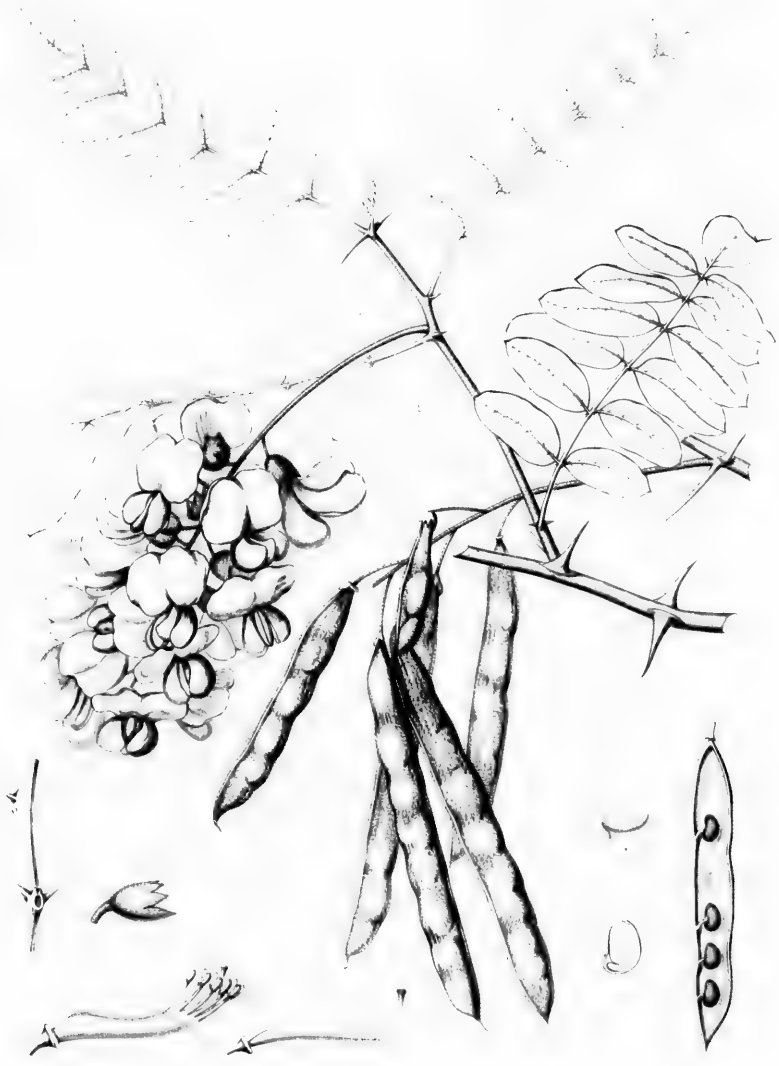

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ROBINIA VISCOSA.

Clammy Locust.

FLOWERS pale rose-colored, in crowded oblong racemes. Legume glandular-hispid. Branches and petioles clammy.

Robinia viscosa, Ventenat, *Hort. Cels*, 4, t. 4; *Mém. de l'Inst. Nat. Sci. Phys. & Math.* v. 114. — Cels, *Mém. de l'Inst. Nat. Sci. Phys. & Math.* v. 110. — Willdenow, *Spec.* iii. 1131; *Enum.* 769; *Berl. Baumz.* 372. — Michaux, *Fl. Bor.-Am.* ii. 65. — *Nouveau Duhamel*, ii. 64, t. 17. — Poiret, *Lam. Dict.* vi. 222. — B. S. Barton, *Bot.* Appx. 29, t. 21. — Persoon, *Syn.* ii. 311. — Desfontaines, *Hist. Arb.* ii. 302. — Michaux f. *Hist. Arb. Am.* iii. 262, t. 2. — Pursh, *Fl. Am. Sept.* ii. 488. — Nuttall, *Gen.* ii. 118. — Hayne, *Dendr. Fl.* 140. — Elliott, *Sk.* ii. 242. — De Candolle, *Prodr.* ii. 262. — Guimpel, Otto & Hayne, *Abbild. Holz.* 81, t. 65. — Sprengel, *Syst.* iii. 247. — Don, *Gen. Syst.* ii. 238. — Spach, *Hist. Vég.* i. 260. — Torrey & Gray, *Fl. N. Am.* i. 295. — Dietrich, *Syn.* iv. 1053. — Chapman, *Fl.* 94. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 49. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 56. — Watson & Coulter, *Gray's Man.* ed. 6, 134.

Robinia glutinosa, Sims, *Bot. Mag.* t. 560. — Koch, *Dendr.* i. 59.

A small tree, thirty or forty feet in height, with a trunk ten or twelve inches in diameter, and slender spreading branches; or a low shrub five or six feet in height. The bark of the trunk is an eighth of an inch thick, smooth, and dark brown tinged with red. The branchlets are dark reddish brown during their first season, and clothed with conspicuous dark glandular hairs, which, like those on the petioles and legumes, exude a clammy, sticky substance;[1] during their first winter they are bright red-brown covered with small black lenticels and very sticky, and in their second year turn light brown and become dry. The winter-buds, which are minute and protected by a scale-like covering, are immersed in the scars left by the leaves of the previous season, and do not appear until the beginning of growth in the spring. The leaves are from seven to twelve inches long, with stout nearly terete dark petioles slightly enlarged at the base, and from thirteen to twenty-one leaflets which are ovate or sometimes acuminate, mucronate, rounded, or pointed at the apex, and wedge-shaped at the base. As they unfold the lower surface is covered with soft silky white pubescence, and the upper surface is slightly puberulent; at maturity they are an inch and a half to two inches long, two thirds of an inch broad, dark green and glabrous above, and pale and coated with pubescence below, especially along the slender yellow midribs and primary veins and on the stout glandular-hispid petiolules. The stipules are subulate, chartaceous, and often deciduous or sometimes develop into stout slender spines. The stipels are very slender, and disappear soon after the leaf has reached its full size. The flowers, which are two thirds of an inch long, appear in June[2] in short ovate crowded grandular-hispid racemes, and are almost inodorous. The slender pedicels are covered with long pale hairs, and are developed from the axils of large lanceolate acuminate dark red bracts contracted at the apex into long setaceous points which are exserted beyond the flower-buds, and mostly fall before the flowers open. The calyx is dark red and covered on the outer surface and on the margin of the subulate lobes with long pale hairs. The corolla is pale rose or flesh color, with a narrow standard marked on the inner surface by a pale yellow blotch, and broad side petals. The legume is linear-lanceolate, narrow winged, from two to three and a half inches in length, and tipped with the remnants of the long slender style. The seed is an eighth of an inch long, dark reddish brown and mottled.

[1] See an article by the French chemist Vauquelin (*Mém. de l'Inst. Nat. Sci. Phys. & Math.* v. 105), entitled *Expériences sur la substance visqueuse qui se rassemble sur l'écorce du Robinia viscosa.*

[2] A second crop of flowers is often produced in August from shoots developed early in the summer, especially on vigorously growing young trees or in years of abundant rainfall.

Robinia viscosa inhabits the high mountains of Carolina, and has now become naturalized through cultivation in many parts of the United States east of the Mississippi River and as far north as eastern Massachusetts.[1]

The wood[2] of *Robinia viscosa* is heavy, hard, and close-grained, with several rows of open ducts clearly marking the layers of annual growth, and many thin medullary rays. It is brown with light yellow sapwood composed of two or three thick layers of annual growth. The specific gravity of the absolutely dry wood is 0.8094, a cubic foot weighing 50.44 pounds.

Robinia viscosa was first noticed by William Bartram[3] in the summer of 1776 on the mountains between the headwaters of the Savannah and Tennessee rivers.[4] It was next found by the French botanist Michaux[5] in 1790 in the same region, and was introduced by him into his garden near Charleston, from which he sent it the next year to his son in Paris. It was first planted in Europe by the French physician Lemonnier[6] in his garden at Montreuil.[7] The excellent habit of the Clammy Locust, its handsome foliage and beautiful flowers, soon attracted the attention of horticulturists, and it has always been a popular garden plant in the United States and in Europe.[8]

[1] *Robinia viscosa*, which appears to be one of the rarest of all our trees, was not seen growing wild in the forests of the southern Alleghany Mountains from the time of the Michaux until 1882, when it was rediscovered by Mr. John Donnell Smith near Highlands, Macon County, North Carolina, covering a rocky slope known as Buzzard Ridge at an elevation of four thousand five hundred feet above the sea-level, and growing as a shrub with stems only a few feet high. It has not been seen in any other locality growing wild. Bartram and Michaux speak of it as a tree forty feet high, and it often attains that height in cultivation.

[2] Taken from a cultivated tree growing in Essex County, Massachusetts.

[3] See i. 16.

[4] *Trav.* 335.

[5] See i. 58.

[6] Louis Guillaume Lemonnier (1717–1799), brother of the astronomer, Pierre Louis Lemonnier, a distinguished Parisian physician, was appointed on the death of Bernard de Jussieu in 1777 professor of botany in the Jardin du Roi, which he is said to have greatly enriched. He soon after abandoned his chair in favor of Antoine Louis de Jussieu and was appointed first physician to Louis XVI. Ruined by the Revolution, Lemonnier retired to Montreuil, where he opened a small shop for the sale of herbs, and in his garden cultivated many American plants given to him by his friends, the two Michaux, passing in these occupations what he declared were the happiest days of his life. His publications relating to plants are not numerous or important. They include a *Lettre sur la Culture du Café* (Paris, 1773) and a few short memoirs. *Monnieria*, a name given by Linnæus to an annual plant of tropical America, preserves the memory of this modest and public-spirited man of science, to whose value, according to the testimony of his contemporaries, scant justice is done in the published results of his observations.

[7] Michaux f. *Hist. Arb. Am.* iii. 264.

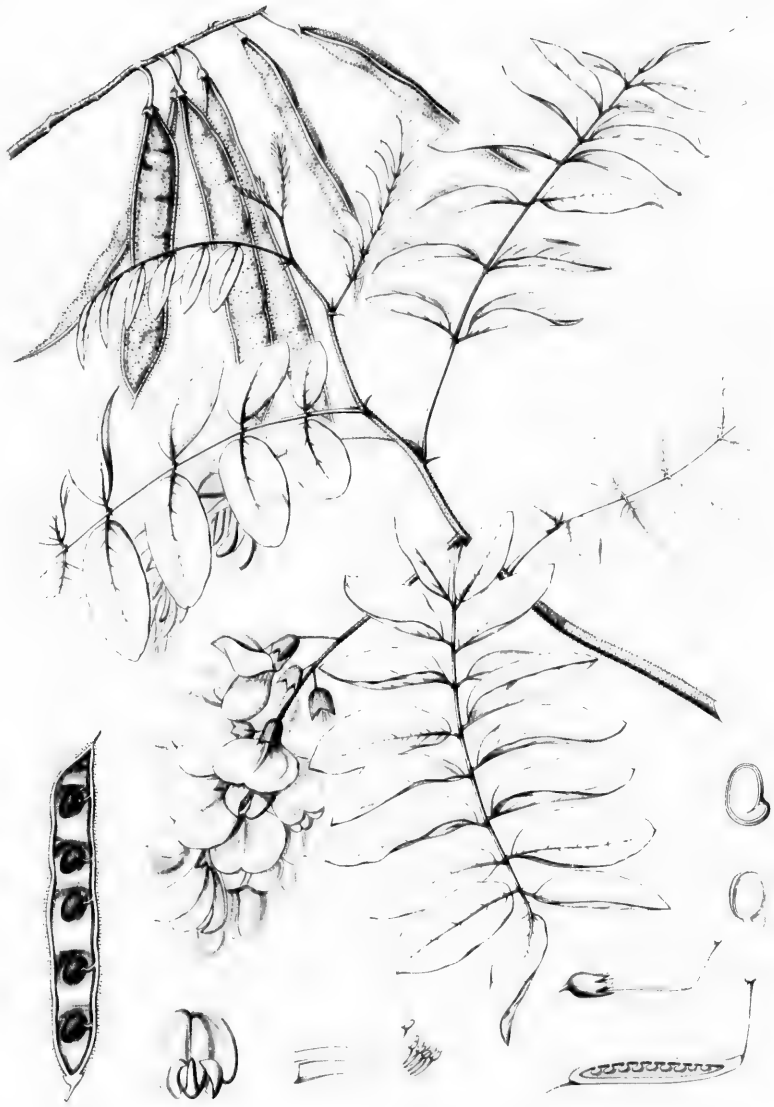
[8] Aiton, *Hort. Kew.* ed. 2, iv. 323. — Loudon, *Arb. Brit.* ii. 626, f. 306, v. t. 87.

Robinia bella-rosea, *Hort.*, a plant sometimes found in gardens with usually glabrous leaflets, rose-colored flowers, and red branches without glandular hairs, is perhaps a hybrid between this species and *R. Pseudacacia*. (Nicholson, *Dict. Gard.*) *Robinia dubia* (Desvaux, *Jour. Bot.* iv. 204) was considered by De Candolle (*Prodr.* ii. 261) a garden hybrid of similar parentage.

EXPLANATION OF THE PLATE.

PLATE CXV. ROBINIA VISCOSA.

1. A flowering branch, natural size.
2. A flower, front view, natural size.
3. A staminal tube, the upper stamen detached, enlarged.
4. A pistil, enlarged.
5. Vertical section of a pistil, enlarged.
6. A raceme of fruit, natural size.
7. A legume, one of the valves removed, natural size.
8. Vertical section of a seed, enlarged.
9. An embryo, much magnified.



OLNEYA.

Flowers in short axillary racemes; calyx subcampanulate, 5-lobed, the lobes imbricated in æstivation; corolla papilionaceous; ovary many-ovuled. Legume compressed, thick-valved, tardily dehiscent. Leaves pinnate, destitute of stipules.

Olneya, Gray, *Mem. Am. Acad.* n. ser. v. 328 (*Pl. Thurber.*). — Bentham & Hooker, *Gen.* i. 500. — Baillon, *Hist. Pl.* ii. 271.

A small tree, with thin scaly bark and stout terete hoary-canescent, slightly many-angled branchlets often armed with stout infrastipular spines. Leaves hoary-canescent, persistent, equally or unequally pinnate, ten to fifteen-foliolate, destitute of stipules and stipels, short-petiolate, often fascicled in former axils; leaflets cuneate, oblong or obovate, entire, obtuse, often mucronate, rigid, short-petiolulate, reticulate-veined, with broad conspicuous midribs. Flowers in short axillary few-flowered hoary-canescent racemes. Bracts and bractlets chartaceous, acute, minute, deciduous before the expansion of the flowers. Pedicels stout, as long as or rather longer than the calyx. Calyx hoary-canescent with short thick pubescence, the lobes ovate, obtuse, almost equal, the two upper connate for the greater part of their length. Disk cupuliform, adnate to the tube of the calyx. Corolla papilionaceous; petals unguiculate, purple, or violet, inserted on the disk; standard orbicular, deeply emarginate, reflexed, furnished at the base of the blade with two infolded ear-shaped appendages covering two prominent callosities; wings oblique, oblong, slightly auriculate at the base of the blade on the upper side, free, as long as the broad obtuse incurved keel-petals. Stamens ten, diadelphous, the superior one free, filling the slit in the staminal tube; filaments filiform, of the same length; anthers uniform, attached on the back, two-celled, the cells opening longitudinally. Ovary sessile or slightly stipitate, pilose, many-ovuled; style inflexed, bearded above the middle; stigma thick and fleshy, depressed-capitate; ovules suspended from the inner angle of the ovary, superposed, amphitropous, the micropyle superior. Legume oblique, compressed, glandular-hairy, light brown, two-valved, often tipped with the remnants of the long persistent style, one to five-seeded; valves thick and coriaceous, unequally and interruptedly convex at maturity by the growth of the seeds. Seeds broadly ovate, slightly angled on the ventral side, estrophiolate, suspended by short thick funicles, destitute of albumen; testa thin, membranaceous, bright chestnut-brown and lustrous. Embryo filling the cavity of the seed; cotyledons thick and fleshy, accumbent on the short incurved radicle, light green.

The wood of Olneya is very heavy, hard, and strong, although brittle. The character of the grain, which is usually contorted, although it increases its beauty, renders it difficult to cut and work. It is rich dark brown striped with red, with thin clear yellow sapwood, and contains numerous thin medullary rays. The specific gravity of the absolutely dry heartwood is 1.1486, a cubic foot weighing 66.07 pounds. It furnishes excellent fuel, and is sometimes manufactured into canes and other small objects.

Olneya was discovered in July, 1852, by Dr. George Thurber, the botanist of the United States and Mexican Boundary Survey Commission, on the table-lands of the valley of the lower Gila River in what is now the Territory of Arizona.

The generic name commemorates the services to botany of Stephen T. Olney.[1] The genus is represented by a single species.

[1] Stephen Thayer Olney (1812–1878) was a native of Providence, Rhode Island, where he was actively engaged during nearly his entire life in business and manufacturing enterprises which left him, however, the opportunity to indulge his taste for botany, and to collect a large and rich herbarium and botanical library which he bequeathed to Brown University, and to study critically the plants of his native State. He published a catalogue of these in 1845, with continuations and emendations in 1846 and 1847; and in 1871 a *List of Rhode Island Algæ*. Mr. Olney was president of the Providence Franklin Society from 1859 to 1869.

OLNEYA TESOTA.

Iron Wood. Arbol de Hierro.

Olneya Tesota, Gray, *Mem. Am. Acad.* n. ser. v. 313 (*Pl. Thurber.*); *Ives' Rep.* 11. — Torrey, *Pacific R. R. Rep.* iv. 82; vii. 10, t. 5; *Bot. Mex. Bound. Surv.* 58. — Walpers, *Ann.* iv. 587. — Cooper, *Smithsonian Rep.* 1858, 265. — Brewer & Watson, *Bot. Cal.* i. 157. — Hemsley, *Bot. Biol. Am. Cent.* i. 260. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 56.

Tesota, Mueller, *Walp. Ann.* iv. 479.

Olneya Tesota sometimes grows to the height of twenty-five or thirty feet, with a short trunk occasionally eighteen inches in diameter and usually divided, four or six feet from the ground, into a number of stout upright branches. The bark of the trunk exfoliates in long longitudinal dark red-brown scales. The branchlets are at first thickly coated with hoary-canescent pubescence which disappears early in their second year, when they are pale green and more or less spotted and streaked with red, becoming pale brown in their third season. The spines, which are often developed in pairs below the leaves, are straight or slightly curved, very sharp and rigid, from an eighth to a quarter of an inch in length, and persistent during at least two years. The leaves are from one to two and a half inches in length, with grooved petioles, and leaflets which are from half to three quarters of an inch long. They appear with the flowers early in June, those of the previous year apparently falling at the same time. The fruit, which is light brown and very glandular, is fully grown in midsummer and ripens before the end of August.

Olneya Tesota is widely distributed through the arid regions of the southwestern part of the continent, from the valley of the Colorado River south of the Mohave Mountains of California to southwestern Arizona, the adjacent portions of Sonora, and Lower California.[1] It occupies the sides of low depressions and arroyos in the desert, and in some portions of its range, especially in Sonora, where it is more abundant and grows to a larger size than in any part of the United States, it is a common tree. No other desert tree is more beautiful than the Tesota when its abundant racemes of large bright flowers are clustered on the end of the branches; and in recent years a number of attempts have been made to introduce it into the gardens of southern Europe, where, however, it has resisted every effort at domestication.[2]

The specific name *Tesota* is that by which this tree, the Arbol de Hierro of the Spaniards in Mexico, was known to the inhabitants of Sonora at the time of its discovery.

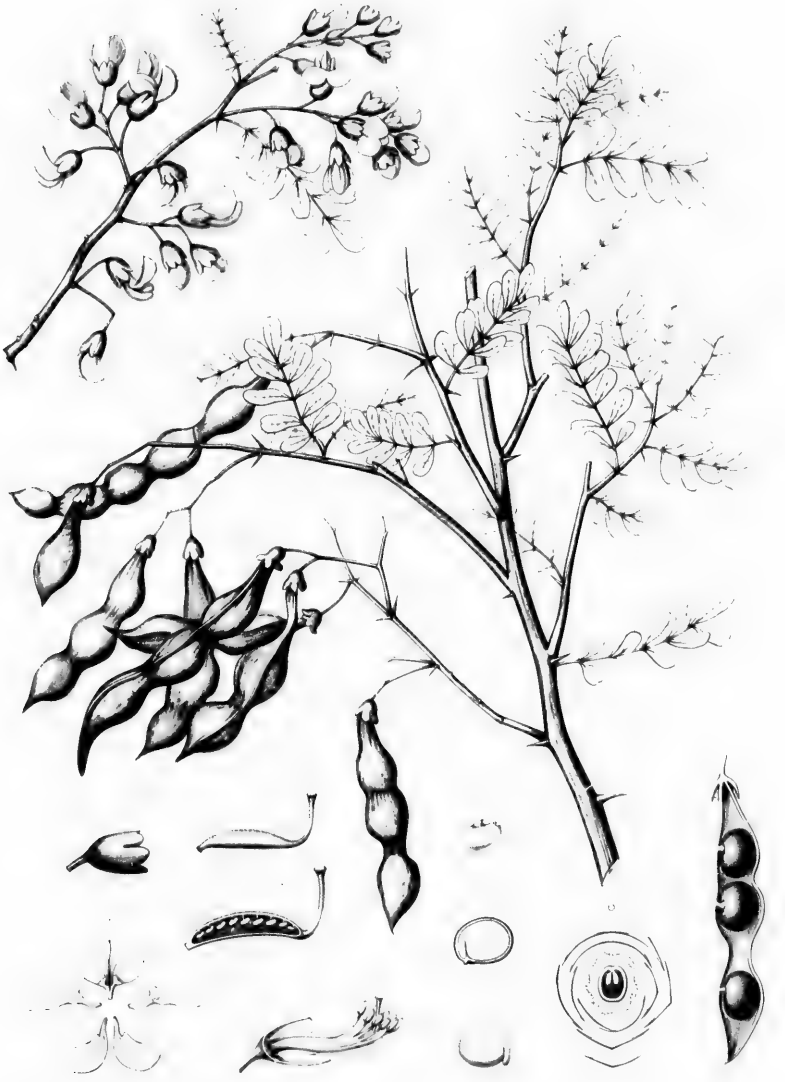
[1] It was found in Lower California by T. S. Brandegee between Comondu and Calamujuet (*Proc. Cal. Acad.* ser. 2, ii. 149 [*Pl. Baja Cal.*]).

[2] The seed germinates readily, but the seedling plants soon become sickly, and perish at the end of a few weeks (Naudin, *Garden and Forest*, iv. 324).

EXPLANATION OF THE PLATE.

Plate CXVI. Olneya Tesota.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A calyx, enlarged.
4. The petals of a flower displayed, enlarged.
5. A flower, the corolla and part of the calyx removed, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. A legume, one of the valves removed, natural size.
11. Vertical section of a seed, natural size.
12. An embryo, enlarged.



ICHTHYOMETHIA.

FLOWERS in ample axillary panicles; calyx 5-lobed, the lobes imbricated in æstivation; corolla papilionaceous; ovary 10 to 12-ovuled. Legume linear, longitudinally 4-winged, indehiscent. Leaves alternate, unequally pinnate, destitute of stipules.

Ichthyomethia, Browne, *Nat. Hist. Jam.* 296.
Piscidia, Linnæus, *Syst. Nat.* ed. 10, 1155; *Gen.* ed. 6, 367. — Adanson, *Fam. Pl.* ii. 326. — A. L. de Jussieu, *Gen.* 358. — Meisner, *Gen.* 89. — Endlicher, *Gen.* 1305. — Bentham & Hooker, *Gen.* i. 550. — Baillon, *Hist. Pl.* ii. 327.

A tree, with red-brown scaly bark and stout terete branchlets marked with many pale lenticular spots. Buds obtuse, their thin scales clothed with silky rufous hairs. Leaves alternate, long-petiolate, five to eleven-foliolate, deciduous; leaflets opposite, the terminal one distant from the others, oval, obovate, or broadly oblong, obtuse or shortly acuminate at the apex, rounded or wedge-shaped at the base, with undulate thickened margins and thick pubescent petiolules, at first coated like the petioles and young branchlets with rufous hairs, at maturity coriaceous and then glabrous and dark green on the upper surface, pale and more or less covered with rufous or canescent pubescence along the elevated conspicuous midribs and primary veins on the lower surface, otherwise glabrous or sometimes covered with soft silky pubescence. Flowers in axillary canescent ovate densely flowered or elongated thyrsoidal panicles with short three to twelve-flowered branches, developed from the naked branchlets of the previous year. Pedicels slender, enlarged at the two extremities, bibracteolate. Bracts minute, caducous. Bractlets minute, scarious, subelliptical, slightly coriaceous. Calyx campanulate, canescent, five-lobed, persistent, the lobes short and broad, the two upper subconnate, the lower broadly triangular. Petals inserted on an annular glandular disk adnate to the interior of the calyx-tube, unguiculate, white tinged with red; standard nearly orbicular, emarginate, hoary-canescent on the outer, marked with a green blotch on the inner surface, the claw as long as the calyx; wings oblong-falcate, auriculate at the base of the blade on the upper side; keel-petals broadly falcate, the claws connate. Stamens ten, the filament of the upper one free at the base only, connate above with the others into a closed tube; anthers uniform, versatile, two-celled, the cells opening longitudinally. Ovary sessile, sericeous, many-ovuled, contracted into a filiform incurved style terminated by the capitate stigma; ovules suspended from the inner angle of the ovary, two-ranked, amphitropous, the micropyle superior. Legume linear-compressed, raised on a stalk longer than the calyx, many-seeded, slightly contracted between the seeds, tomentose-canescent or glabrate, thin walled, indehiscent, longitudinally four-winged; the wings developed from the dorsal and ventral sutures, broad, continuous or interrupted by the abortion of some of the ovules, membranaceous, softly pubescent, laterally many-veined, their margins undulate or irregularly cut. Seed oval, compressed, destitute of albumen, laterally attached by a short thick funicle; testa thin, crustaceous, red-brown, not lustrous. Embryo filling the cavity of the seed; cotyledons plano-convex, oval, fleshy; radicle short, inflexed.

The wood of Icthyomethia is very heavy, hard, and close-grained, although not strong, with a fine surface susceptible of taking a beautiful polish; it is clear yellow-brown, with thick lighter colored sapwood, and is extremely durable in contact with the ground. The specific gravity of the absolutely dry wood is 0.8734, a cubic foot weighing 54.43 pounds. It is largely used in Florida in boat-building and for firewood and charcoal.

Icthyomethia, especially the bark of the roots, contains an active principle, *Piscidin*, which is

sedative and hypnotic, and has been found effective in producing sleep without subsequent injurious effects, although inferior to opium as an analgesic. The fluid extract of the bark of the root locally applied has been successfully employed in alleviating toothache, or, taken internally, in relieving pain.[1] The bark of the roots, with the young branches and powdered leaves, has been used in the West Indies from the time of the Caribs to stupefy fish and facilitate their capture.[2]

The generic name, formed from *ἰχθύς* and *μέθη*, indicates the Carib use of the tree. The genus is represented by a single species.

[1] Barham, *Hort. Amer.* 52. — Lindley, *Fl. Med.* 246. — William Hamilton, *Pharm. Jour.* iv. 76. — *U. S. Dispens.* ed. 14, 1734. — *The Pharmacology of the Newer Materia Medica*, 1890, 593, f.

[2] The earlier European travelers in the Antilles and South America describe the employment by the natives of Ichthyomethia and some allied leguminous trees for this purpose. The first mention of the custom appears in Oviedo y Valdes's *Historia Natural y General de las Indias*, published in 1535, in which this passage occurs: —

"Y tambien usan de cierta hierva que se dice baygua, en lugar de belesa ò barbasco: . . . Esta baygua es como bexuco, é picada é maxada aprovecha para embarbascar é adormecer el pescado, como he dicho." (Lib. xiii. cap. i.)

It is probably the *Bois à Enyurer les Poissons* of Du Tertre (*Hist. Gen. des Iles de Saint Christophe*, etc., 216) and of Labat (*Nouveau Voyage aux Isles de l'Amérique*, i. 418).

Rochefort speaks of it as "celuy dont la racine étant broyée, & jettée dans les rivieres, enyure les Poissons." (*Histoire Naturelle et Morale des Isles Antilles*, 103.)

ICHTHYOMETHIA PISCIPULA.

Jamaica Dogwood.

Ichthyomethia Piscipula, A. S. Hitchcock, *Garden and Forest*, iv. 472.

Erythrina Piscipula, Linnæus, *Spec.* 707.

Piscidia Erythrina, Linnæus, *Syst. Nat.* ed. 10, 1155; *Spec.* ed. 2, 993. — Jacquin, *Enum. Pl. Carib.* 27; *Stirp. Am.* 209; *Hist. Select. Stirp. Am.* 102. — Miller, *Dict.* ed. 8. No. 1. — Swartz, *Obs.* 276. — Lamarck, *Dict.* i. 433. — Willdenow, *Spec.* iii. 919. — Titford, *Hort. Bot. Am.* 84. — Lunan, *Hort. Jam.* i. 269. — Kunth, *Syn.* iv. 73. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 382. — De Candolle, *Prodr.* ii. 267. — Poiret, *Lam. Dict. Ill.* iii. 163, t. 605. — Sprengel, *Syst.* iii. 228. — Descourtilz, *Fl. Med. Antil.* iii. 203, t. 196. — Spach, *Hist. Vég.* i. 266. — Don, *Gen. Syst.* ii. 242. — Macfadyen, *Fl. Jam.* 258. — Nuttall, *Sylva*, ii. 31, t. 52. — Dietrich, *Syn.* iv. 1224. — Bentham, *Jour. Linn. Soc.* iv. Suppl. 116; *Bot. Voy. Sulphur*, 81. — Chapman, *Fl.* 110. — Grisebach, *Fl. Brit. W. Ind.* 200. — Hemsley, *Bot. Biol. Am. Cent.* i. 319. — Sauvalle, *Fl. Cub.* 32. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 57.

P. Carthagenensis, Jacquin, *Enum. Pl. Carib.* 27; *Stirp. Am.* 210; *Hist. Select. Stirp. Am.* 103. — Linnæus, *Spec.* ed. 2, 993. — Willdenow, *Spec.* iii. 920. — Lunan, *Hort. Jam.* i. 270. — De Candolle, *Prodr.* ii. 267. — Sprengel, *Syst.* iii. 228. — Don, *Gen. Syst.* ii. 242. — Spach, *Hist. Vég.* i. 266. — Macfadyen, *Fl. Jam.* 259. — Dietrich, *Syn.* iv. 1224.

P. Piscipula, Sargent, *Garden and Forest*, iv. 436.

A tree, forty or fifty feet in height, with a trunk often two or three feet in diameter and stout upright-growing sometimes contorted branches forming an irregular head. The bark of the trunk is an eighth of an inch thick, with a light red-brown surface which divides into small square scales. The branchlets when they first appear are coated with thick rufous pubescence which disappears during the summer, and in their first winter they are glabrous or glabrate, bright reddish brown, and conspicuously marked by oblong longitudinal lenticular white spots and large elevated leaf-scars. The leaves, which in Florida are deciduous in early spring, appear after the flowering period. They are from four to nine inches in length, with stout petioles slightly enlarged at the base, the rachis being sometimes extended for nearly an inch between the upper pair and the terminal leaflet. The leaflets are from three to four and a half inches in length and an inch and a half to nearly two inches in breadth, with thick petiolules half an inch long. The flowers are three quarters of an inch in length, and are borne on slender pedicels which are sometimes an inch and a half long, and which appear jointed from the prominent elevated persistent scars left by the falling of the bractlets. The flower-clusters are sometimes ten or twelve inches in length, with long graceful few-flowered branches, or often are not more than two to four inches long, compact, and densely flowered. They appear in Martinique in February, and in Florida in May; and as they are produced in great quantities near the ends of all the branches, the trees are handsome and conspicuous at the flowering time, although bare of leaves.[1] The fruit ripens in July and August, and is light brown, three or four inches long, and from an inch to an inch and a half across the thin papery wings.

Ichthyomethia Piscipula is one of the commonest of the tropical trees which grow in Florida, where it occurs on the shores of Bay Biscayne, on many of the southern keys, and on the west coast from the neighborhood of Pease Creek to Cape Sable. It abounds in many of the West India islands, and occurs in southern Mexico.

The earliest description of *Ichthyomethia Piscipula* was published in 1689 by Paul Hermann in his *Paradisi Batavi Prodromus*.[2]

[1] Baron Eggers notices (*Bull. U. S. Nat. Mus.* No. 13, 45) that only those individuals which are going to flower drop their leaves.

[2] *Coral arbor polyphylla non spinosa*, 329.

Phaseolo affinis Arbor Indica Coral dicta polyphyllos, non spinosa, foliis mollibus, subhirsutis, Plukenet, *Phyt.* t. 104, f. 3; *Alm. Bot.* 203.

Coral arbor polyphylla non spinosa fraxini folio, siliqua alis foliaceis extantibus, rotæ molendinariæ fluviatilis, vel seminum laserpitij instar, aucta, Sloane, *Cat. Pl. Jam.* 143; *Nat. Hist. Jam.* ii. 39, t. 176, f. 4, 5. — Ray, *Hist. Pl.* iii. *Dendr.* 108.

Pseudo-Acacia siliquis alatis, Plumier, *Cat.* 19.

According to Aiton[1] it was cultivated in England as early as 1690 in the Royal Gardens at Hampton Court.

Ichthyomethia Piscipula was first detected in Florida by Dr. J. L. Blodgett.[2]

Robinia pedunculis ramosis, siliquis membranaceis, Pl. Am. ed. Burmann, 229, t. 233, f. 2.

Robinia foliis impari-pinnatis, foliolis ovatis acuminatis, ramis nodosis glabris, pedunculis racemosis, Miller, *Dict.* ed. 7.

Ichthyomethia, foliis pinnatis ovatis, racemis terminalibus, siliquis quadrialatis, Browne, *Nat. Hist. Jam.* 296.

[1] *Hort. Kew.* iii. 9.

[2] See i. 33.

EXPLANATION OF THE PLATES.

PLATE CXVII. ICHTHYOMETHIA PISCIPULA.

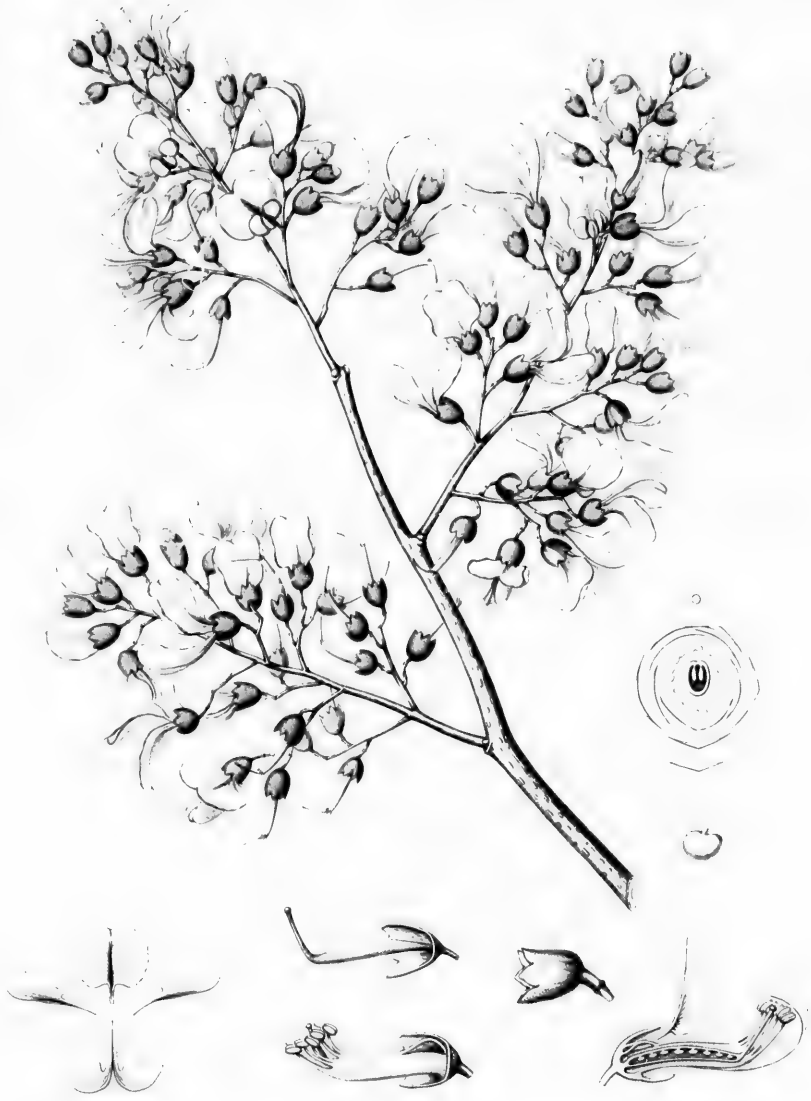
1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. Vertical section of a flower, enlarged.
5. A calyx, enlarged.
6. A flower, the corolla and part of the calyx removed, enlarged.
7. A pistil and part of the calyx, enlarged.
8. An ovule, much magnified.

PLATE CXVIII. ICHTHYOMETHIA PISCIPULA.

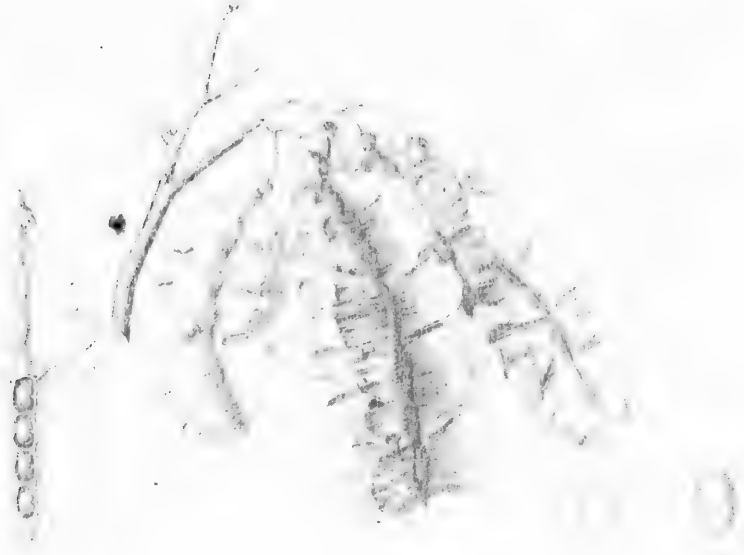
1. A fruiting branch, natural size.
2. A fruit, a portion of one wall removed, natural size.
3. A seed, enlarged.
4. Vertical section of a seed, enlarged.
5. An embryo, much magnified.
6. A leaf, natural size.

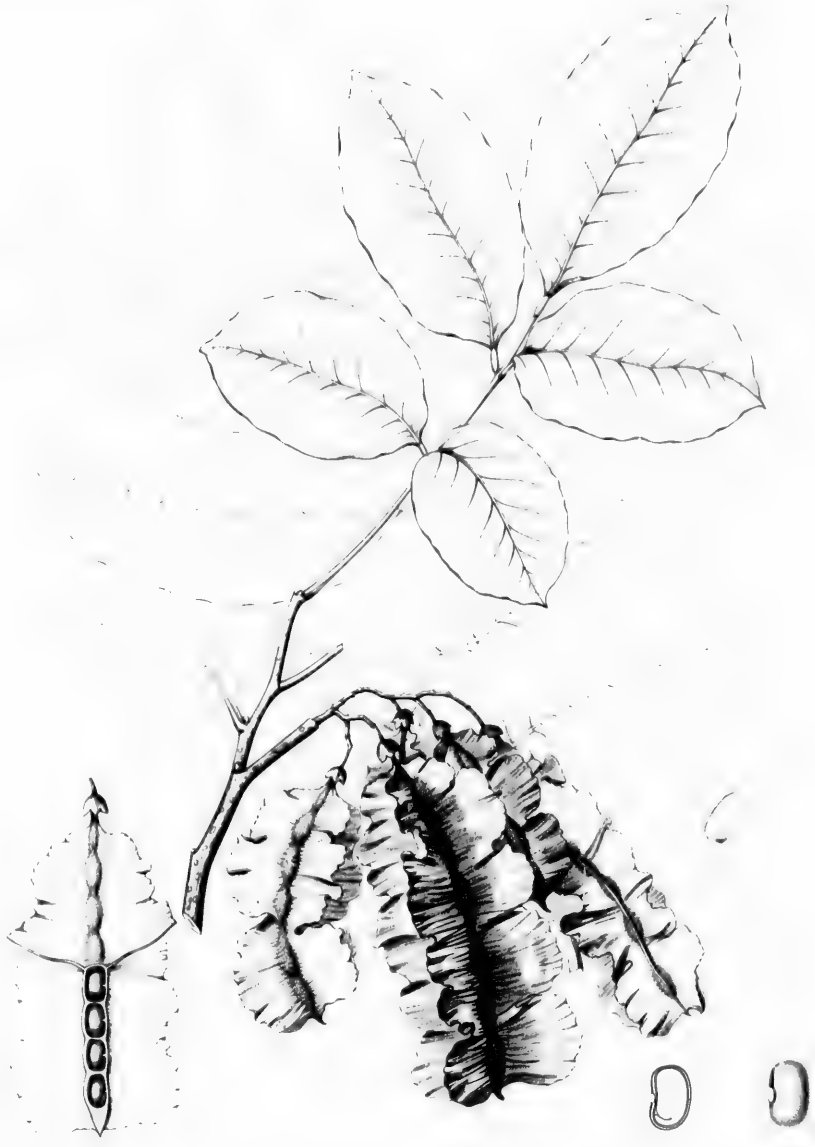
Gardens at

alibus, siliquis



LOBELIA PINNATA





CLADRASTIS.

Flowers in ample terminal panicles; calyx 5-toothed, the teeth imbricated in æstivation; corolla papilionaceous; stamens distinct; ovary stipitate, many-ovuled. Legume linear-compressed, tardily dehiscent. Leaves unequally pinnate, destitute of stipules.

Cladrastis, Rafinesque, *Neogen.* 1. — Endlicher, *Gen.* 1309. — Bentham & Hooker, *Gen.* i. 554 (excl. *Maackia*). — Baillon, *Hist. Pl.* ii. 361 (excl. *Maackia*).

A tree, with copious watery juice, smooth gray bark, slender slightly zigzag terete branchlets, infrapetiolar buds, and fibrous roots. Buds four together, superposed, flattened by mutual pressure into an acuminate cone, covered individually with thin lanceolate scales coated with lustrous brown tomentum, and inclosed collectively in the hollow base of the petiole, the largest and upper one only developing, the lowest minute and rudimentary. Leaves alternate, petiolate, the stout terete petioles abruptly enlarged at the base, seven to eleven-foliolate, deciduous; leaflets usually alternate, broadly ovai, the terminal one rhomboid-ovate, contracted at the apex into a short, broad point, wedge-shaped at the base, entire, petiolulate, destitute of stipels, covered at first like the young shoots with fine silvery or on the midrib slightly rufous pubescence, at maturity thin, glabrous, dark yellow-green on the upper, and pale on the lower surface, the midribs and numerous primary veins conspicuous, deeply grooved above, light yellow below. Flowers in long graceful nodding terminal panicles, the lower branches racemose and often springing from the axils of solitary flowers, the main axis slightly zigzag, and, like the branches, covered at first with a glaucous bloom, and slightly pilose. Bracts lanceolate, scarious, early deciduous. Pedicels solitary, slender, puberulous, bibracteolate near the middle, the bractlets scarious, minute, caducous. Calyx cylindrical-campanulate, enlarged on the upper side, obliquely obconic at the base, puberulous within and without, the teeth nearly equal, short, and obtuse, the two upper subconnate. Disk cupuliform, adnate to the interior of the calyx-tube. Petals white, unguiculate; standard nearly orbicular, entire or slightly emarginate, reflexed above the middle, barely longer than the straight oblong wings, slightly bi-auriculate at the base of the blade, marked on the inner surface with a pale yellow blotch; keel-petals free, oblong, nearly straight, obtuse, slightly subcordate or bi-auriculate at the base. Stamens ten, free; filaments filiform, slightly incurved near the summit, glabrous; anthers attached on the back at the middle, versatile, two-celled, the cells opening longitudinally. Ovary linear, stipitate, bright red, villose with long pale hairs, many-ovuled, contracted into a long slender glabrous slightly incurved subulate style; stigma terminal, minute; ovules suspended from the inner angle of the ovary, superposed, amphitropous, the micropyle superior. Legume glabrous, short-stalked, linear-compressed, the upper margin slightly thickened, tipped with the remnants of the persistent style, four to six-seeded, ultimately dehiscent, the valves thin and membranaceous. Seed oblong-compressed, scarcely strophiolate, destitute of albumen, attached by a slender funicle; testa thin, membranaceous, dark brown. Embryo filling the cavity of the seed; cotyledons fleshy, oblong, flat; radicle short, inflexed.

The wood of Cladrastis is heavy, very hard, strong, and close-grained, with a smooth satiny surface capable of receiving a good polish, the layers of annual growth being clearly marked by several rows of open ducts. In color it is bright clear yellow changing to light brown on exposure, the thin sapwood being almost white. The specific gravity of the absolutely dry wood is 0.6278, a cubic foot weighing 39.12 pounds. It is used for fuel and occasionally for gun-stocks, and yields a clear yellow dye. The genus is not known to possess other useful properties.

Cladrastis was discovered in March, 1796,[1] by the French botanist Michaux,[2] near Fort Blount on the Cumberland River.[3]

The generic name, from κλάδος and θραυστός, relates to the brittleness of the branches. The genus is represented by a single species.[4]

[1] Michaux, *Jour.* in *Proc. Am. Phil. Soc.* xxvi. 135.

[2] See i. 58.

[3] A letter written by Michaux to William Blount, governor of the Ohio Territory, suggesting the value of the wood of this tree as a dyewood, was published in the *Knoxville Gazette* of March 15, 1796. (Michaux f. *Voyage à l'Ouest des Monts Alleghanys*, 255.)

[4] Maackia (Ruprecht, *Bull. Acad. St. Pétersbourg*, xv. 143, t. 1, f. 2), a small leguminous tree of the valley of the Amour River and of Japan, now well known in cultivation, was referred by Bentham (Bentham & Hooker, *Gen.* i. 554) to Cladrastis, from which, however, it appears generically distinct in its solitary extra-petiolar buds, accrescent bud-scales persistent on the base of the young shoots, and erect spicate inflorescence, geminate pedicels, four-toothed calyx, filaments connate at the base, the thickened suture of the pod, and in the character of its bark and its general habit. (See Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xviii. 400 [*Mel. Biol.* ix. 72].)

CLADRASTIS LUTEA.

Yellow Wood. Virgilia.

Cladrastis lutea, Koch, *Dendr.* i. 6. — Sargent, *Garden and Forest*, ii. 375.

Virgilia lutea, Michaux f. *Hist. Arb. Am.* iii. 266, t. 3. — Pursh, *Fl. Am. Sept.* i. 309. — Nuttall, *Gen.* i. 284. — Hayne, *Dendr. Fl.* 53. — Loiseleur, *Herb. Amat.* iii. t. 197. — De Candolle, *Prodr.* ii. 98. — Sprengel, *Syst.* iv. pt. ii. 171. — Don, *Gen. Syst.* ii. 112. — Spach, *Hist. Vég.* i. 163. — Dietrich, *Syn.* ii. 1501. — Loudon, *Arb. Brit.* ii. 565, t. 78.

C. tinctoria, Rafinesque, *Neogen.* 1; *Med. Fl.* ii. 210; *New Sylva*, iii. 83. — Torrey & Gray, *Fl. N. Am.* i. 391. — Walpers, *Rep.* i. 807. — Chapman, *Fl.* 113. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 57. — Watson & Coulter, *Gray's Man.* ed. 6, 127.

Cladrastis lutea is a tree, sometimes fifty or sixty feet in height, with a trunk from a foot and a half to two feet or exceptionally to four feet in diameter, usually divided six or seven feet from the ground into two or three stems, and rather slender wide-spreading more or less pendulous brittle branches forming a wide graceful head. The bark of the trunk varies from an eighth to a quarter of an inch in thickness and has a smooth silvery gray or light brown surface, while that of the branches is lighter colored. The branchlets are clothed with pubescence when they appear, but soon become glabrous, and during their first season are light brown tinged more or less with green, especially on the shaded side, very smooth and lustrous, and covered with numerous darker colored lenticels; during their first winter they are bright red-brown, still lustrous, and marked with large elevated leaf-scars surrounding the buds, and the following year are dark brown and less lustrous. The leaves, which appear in early spring, are eight to twelve inches long; the leaflets are three or four inches in length and an inch and a half to two inches in breadth, the terminal one rather shorter than the others and from three to three and a half inches broad. The leaves turn a bright clear yellow rather late in the autumn some time before falling. The flowers, which appear in the middle of June in panicles twelve or fourteen inches long and five or six inches broad, are slightly fragrant. The fruit, which is fully grown by the middle of August, ripens in September, when the legumes soon fall to the ground and then open, the seed germinating the following spring.

Cladrastis lutea is one of the rarest and most local of the trees of eastern North America; it is found on the limestone cliffs of the Kentucky and Dick Rivers in central Kentucky, in central Tennessee where, perhaps, in the neighborhood of Nashville it is more abundant and attains a larger size than elsewhere, and in a few localities on the western slopes of the high mountains of eastern Tennessee, and in Cherokee County, North Carolina. It generally grows in rich soil, often overhanging the banks of rapid streams, and its usual companions in the forest are the Black Walnut, the White Ash, the White Oak, the Mulberry, the Butternut, the Shellbark Hickory, and the Tulip Poplar.

Cladrastis lutea is one of the most beautiful flowering trees of the American forests. It was introduced into cultivation by the elder Michaux, and has become one of the most valued ornamental trees in the United States and in those parts of Europe where the summer sun is sufficiently hot to ripen the wood thoroughly and insure the free production of flowers which appear in profusion only in alternate years. It is hardy as far north as New England and the province of Ontario. Few insects prey on the handsome foliage of *Cladrastis lutea*;[1] fungal disease is unknown to it, and the brittleness of the branches, which are often broken by high winds, is the only objection to the Virgilia[2] as an ornament to the garden and the lawn, which it graces with the lightness of its port, its smooth delicate bark, rich and ample foliage, and handsome flowers.

[1] Occasionally leaf-eating insects and red spiders slightly injure this tree in cultivation.

[2] In cultivation *Cladrastis lutea* is almost universally known as Virgilia; it is also sometimes called Yellow Wood and Gopher Wood in the region where it naturally grows.

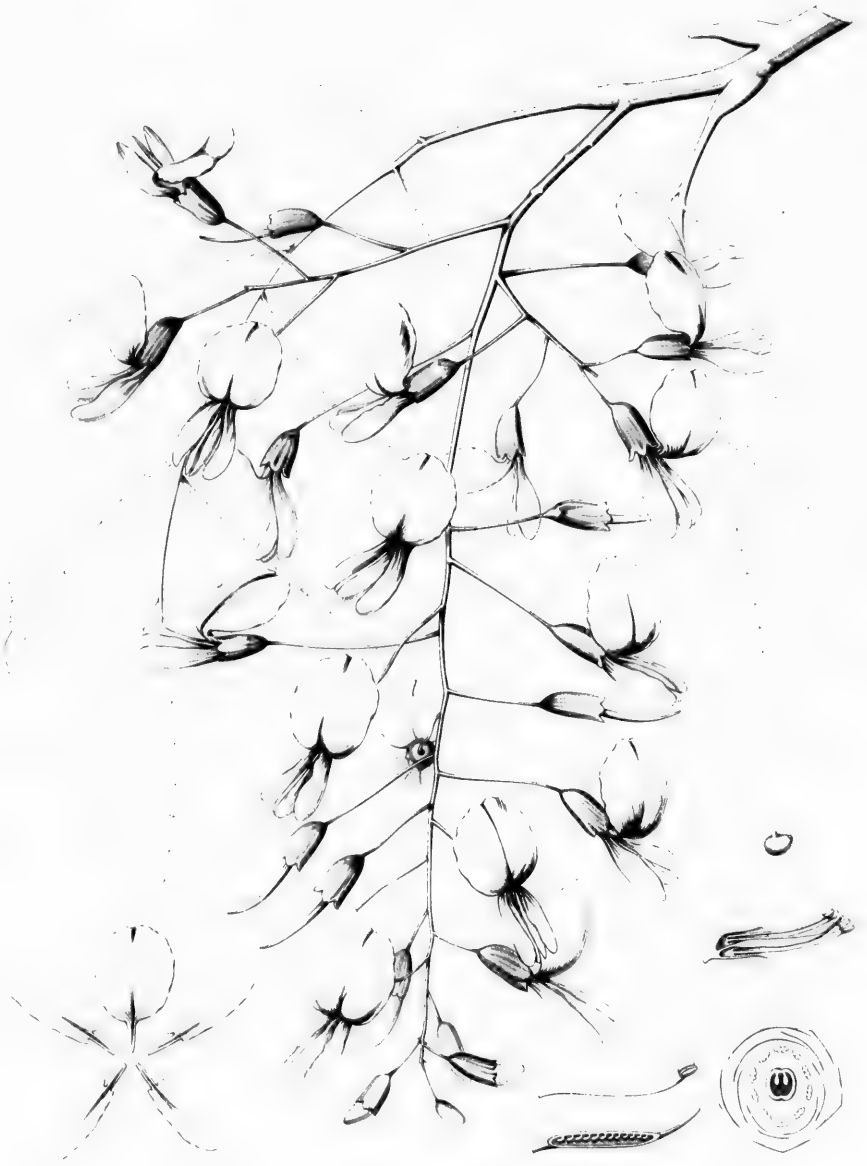
EXPLANATION OF THE PLATES.

Plate CXIX. Cladrastis lutea.

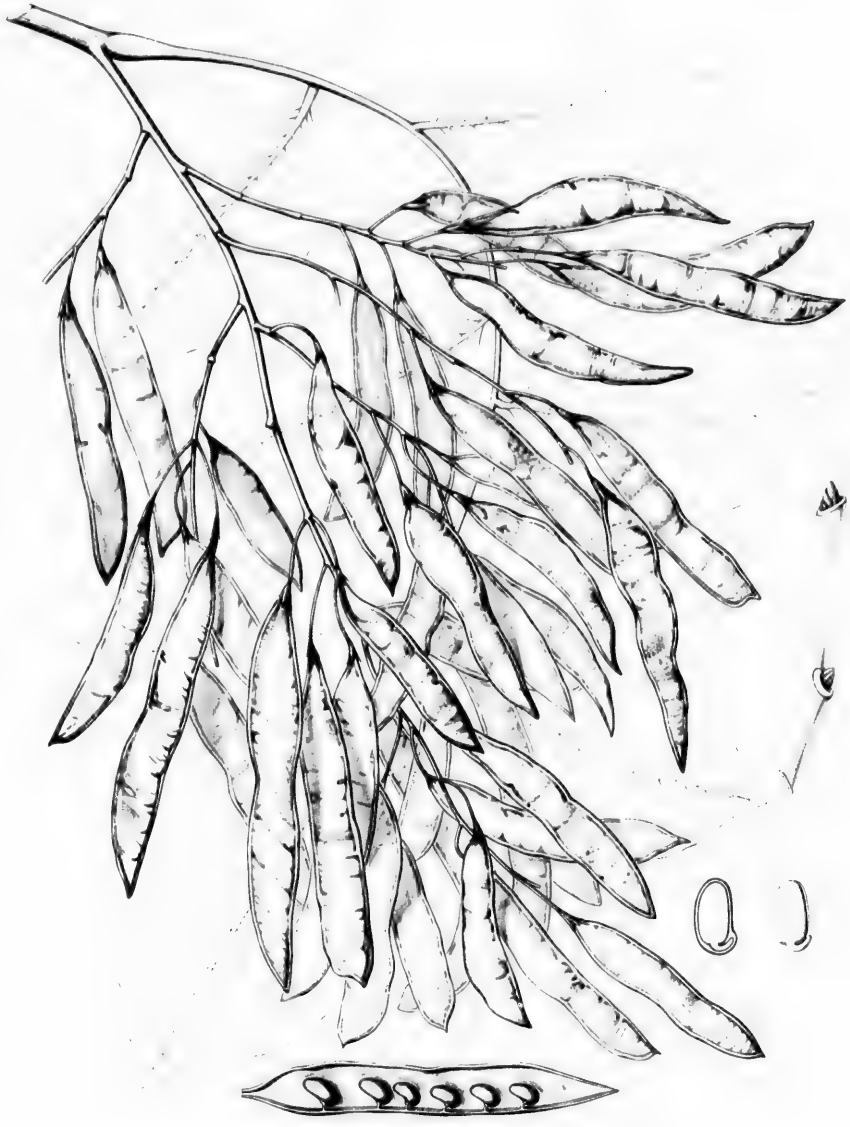
1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. Vertical section of a flower, natural size.
5. A stamen, natural size.
6. Vertical section of an ovary, natural size.
7. An ovule, magnified.

Plate CXX. Cladrastis lutea.

1. A fruiting branch, natural size.
2. A legume, one of the valves removed, natural size.
3. Vertical section of a seed, enlarged.
4. An embryo, enlarged.
5. A winter branchlet, natural size.



CLAPPERTIA LUTEA



SOPHORA.

Flowers in terminal simple racemes or leafy panicles, papilionaceous; calyx 5-toothed, the short teeth nearly equal, imbricated in æstivation; stamens free or rarely subconnate; ovary short-stalked, many-ovuled. Legume moniliform, indehiscent, or tardily dehiscent. Leaves unequally pinnate.

Sophora, Linnæus, *Gen.* 125. — Adanson, *Fam. Pl.* ii. 318. — A. L. de Jussieu, *Gen.* 352. — De Candolle, *Mém. Légum.* 166. — Endlicher, *Gen.* 1308. — Meisner, *Gen.* 80. — Bentham & Hooker, *Gen.* i. 555. — Baillon, *Hist. Pl.* ii. 358.

Broussonetia, Ortega, *Dec.* v. 61 (not Ventenat).

Edwardsia, Salisbury, *Trans. Linn. Soc.* ix. 298. — Meisner *Gen.* 80. — Endlicher, *Gen.* 1308.

Patrinia, Rafinesque, *Jour. Phys.* lxxxix. 97 (not A. L. de Jussieu).

Zanthyrsis, Rafinesque, *New Fl.* iii. 84.

Agastianis, Rafinesque, *New Fl.* iii. 85.

Styphnolobium, Schott, *Wien. Zeitschr.* 1830, 844. — Endlicher, *Gen.* 1309.

Dermatophyllum, Scheele, *Linnæa*, xxi. 458.

Gœbelia, Bunge, *Boissier Fl. Orient.* ii. 628.

Keyserlingia, Bunge, *Boissier Fl. Orient.* ii. 629.

Trees, shrubs, and perennial herbs, with unarmed terete branches, supra or subpetiolar buds, and fibrous roots. Leaves alternate, unequally pinnate, persistent or deciduous; stipules minute, deciduous; leaflets numerous and small or few and ample, membranaceous, or coriaceous; stipels minute, setaceous, often wanting. Flowers in simple racemes terminal or panicled from the axils of the upper leaves. Bracts and bractlets linear, minute, deciduous, or often wanting. Calyx broadly campanulate, often slightly turbinate or obconic at the base, obliquely truncate, five-toothed, the short teeth nearly equal or the two upper subconnate, often somewhat larger than the others. Disk cupuliform, glandular, adnate to the calyx-tube. Petals white, yellow, or rarely violet blue, unguiculate; standard broadly obovate or orbicular, erect or spreading, usually shorter, rarely longer than the keel-petals; wings oblong-oblique; keel-petals oblong, suberect, as long as the wings or rather longer, overlapping each other at the back, barely connate. Stamens ten, free, or nine of them slightly connate at the base, uniform; anthers attached on the back near the middle, two-celled, the cells opening longitudinally. Ovary shortly stipitate, contracted into an incurved style terminated by a minute truncate or slightly rounded stigma; ovules indefinite, suspended from the inner angle of the ovary, superposed, amphitropous, the micropyle superior. Legume moniliform, terete or slightly compressed, naked or longitudinally four-winged, fleshy, coriaceous or woody, many-seeded, each seed inclosed in a separate cell, indehiscent or two-valved and tardily dehiscent. Seed globular, oblong or flattened, estrophiolate or nearly so, albuminous or destitute of albumen; testa thick, membranaceous, or crustaceous. Cotyledons thick and fleshy; radicle very short and straight or more or less elongated and incurved or inflexed.

Sophora is scattered through the warm parts of the world with twenty-two recognized species. Of these *Sophora tomentosa*,[1] a large shrub, is widely distributed on tropical ocean shores in the two worlds, reaching those of southern Florida and western Texas. Five other species, two of which are small trees, inhabit the territory of the United States[2] and Mexico.[3] The genus is represented in the

[1] Linnæus, *Spec.* 373. — De Candolle, *Prodr.* ii. 95. — Torrey & Gray, *Fl. N. Am.* i. 389. — Miquel, *Fl. Ind. Bat.* i. pt. i. 124. — Bentham, *Martius Fl. Brasil.* xv. pt. i. 314. — Chapman, *Fl.* 113. — Grisebach, *Fl. Brit. W. Ind.* 203. — Hemsley, *Bot. Challenger Exped.* i. pt. iii. 144.

[2] Nuttall, *Gen.* i. 280. — Torrey & Gray, *l. c.* — Gray, *Ives' Rep.* 10. — Chapman, *l. c.* — Watson, *Proc. Am. Acad.* xi. 135. — Brewer & Watson, *Bot. Cal.* i. 114. — Watson & Coulter, *Gray's Man.* ed. 6, 127.

[3] Hemsley, *Bot. Biol. Am. Cent.* i. 320.

Orient,[1] in southern Asia[2] where ten species occur, in China[3] and Japan,[4] Australia,[5] New Zealand,[6] the Hawaiian Islands,[7] Chile,[8] and tropical[9] and southern Africa.[10] It once existed in Europe, where traces of *Sophora Europæa* are common in the rocks of the lower Miocene period.[11]

The genus has not many useful properties. In China a drug prepared from the roots and leaves of *Sophora tomentosa* is used in large quantities as a tonic and diuretic;[12] and a yellow dye is made from the pods of *Sophora Japonica*, while the flower-buds of this species, which form an important article of commerce, are used to dye cloth yellow and blue cloth green, and in astringent remedies.[13] The leaves have been successfully used, it is said, as a cathartic. The seeds of the Texas and Mexican *Sophora secundiflora* contain a poisonous alkaloid, *Sophoria*, which possesses strong narcotic properties, and are believed to have supplied the Indians of Texas with a means of intoxication.[14] The Hawaiian *Sophora chrysophylla*[15] produces hard, durable, and very valuable timber, and the wood of the New Zealand and Chilian *Sophora tetraptera*[16] is distinguished for its great strength, toughness, and elasticity.[17]

Many species of Sophora are valuable ornamental plants. *Sophora Japonica*,[18] which was one of the first Asiatic trees introduced into Europe, is now a familiar inhabitant of the gardens and parks of all temperate regions, and several species of the section Edwardsia, natives of New Zealand, Chile, and the Hawaiian Islands, and distinguished principally by their winged legumes, are sometimes cultivated in European gardens,[19] where the Indian *Sophora glauca*[20] and *S. heptaphylla*[21] are also occasionally seen.

[1] Bunge, *Boissier Fl. Orient.* ii. 628, 629 (Gœbelia and Keyserlingia).

[2] Wight & Arnott, *Prodr. Fl. Ind.* 179. — Thwaites, *Enum. Pl. Zeylan.* 94. — Hooker f. *Fl. Brit. Ind.* ii. 248.

[3] Franchet, *Pl. David.* i. 100. — Hemsley, *Jour. Linn. Soc.* xxiii. 201.

[4] Thunberg, *Fl. Jap.* 178. — Miquel, *Prol. Fl. Jap.* 241. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xviii. 398 (*Mel. Biol.* ix. 71). — Franchet & Savatier, *Enum. Pl. Jap.* i. 113.

[5] Bentham, *Fl. Austral.* ii. 274.

[6] Hooker f. *Fl. New Zealand*, i. 52.

[7] Hillebrand, *Fl. Haw. Is.* 108.

[8] C. Gay, *Fl. Chil.* ii. 214 (Edwardsia).

[9] Oliver, *Fl. Trop. Afr.* ii. 253.

[10] Harvey & Sonder, *Fl. Cap.* ii. 265.

[11] Saporta, *Origine Paléontologique des Arbres*, 314.

[12] Smith, *Chinese Mat. Med.* 202. — Maiden, *Useful Native Plants of Australia*, 204.

[13] Smith, *l. c.* 201.

[14] H. C. Wood, *Phil. Med. Times*, Aug. 4, 1877. — Rothrock, *Bot. Gazette*, ii. 133. — *Nat. Dispens.* ed. 2, 1333. — Havard, *Proc. U. S. Nat. Mus.* viii. 500.

[15] Seemann, *Fl. Vit.* 66. — Hillebrand, *Fl. Haw. Is.* 108.

Edwardsia chrysophylla, Salisbury, *Trans. Linn. Soc.* ix. 299, t. 26. f. 1.

[16] Aiton, *Hort Kew.* ii. 43. — *Bot. Mag.* 107. — *Nouveau Duhamel*, iii. 82, t. 20.

[17] Kirk, *Forest Fl. New Zealand*, 84, t. 50, 51, 52.

[18] Linnæus, *Mant.* 68. — *Nouveau Duhamel*, iii. 84, t. 21. — De Candolle, *Prodr.* ii. 95. — Miquel, *Prol. Fl. Jap.* 241. — Franchet & Savatier, *Enum. Pl. Jap.* i. 113. — Franchet, *Pl. David.* i. 100. — Hemsley, *Jour. Linn. Soc.* xxiii. 202.

S. Sinica, Trochereau, *Jour. Phys.* xiv. 248.

Styphnolobium Japonicum, Schott, *Wien. Zeitschr.* 1830, 844.

Sophora Japonica was sent to Europe from China by the Père d'Incarville in 1747 (Guerrapain, *Notice sur la Culture du Sophora, du Platane et de l'Anne.* — Desfontaines, *Hist. Arb.* ii. 258) and was planted by Bernard de Jussieu in the garden of the Petit Trianon several years before it reached England, where it was introduced by the nurseryman James Gordon in 1753 (Aiton, *Hort. Kew.* ii. 45). It first flowered in Europe in 1779 in the garden of the Maréchal de Noailles at Saint-Germain-en-Laye, and in the same year in that of the Petit Trianon at Versailles.

Sophora Japonica appears to be indigenous to northern, central, and western China, and is cultivated on a considerable scale in some parts of the empire for its flower-buds. It is supposed to have been introduced into Japan, where, however, Rein (*Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 297) found it scattered over the entire country, especially in the broad-leaved forests of the north.

In the United States, where *Sophora Japonica* is hardy as far north as eastern New England, and in Europe, it forms a handsome tree sometimes forty or fifty feet in height, with a dense broad head of bright green branches and dark lustrous foliage. It is valuable as an ornamental plant from the fact that its white flowers, produced in loose panicles at the end of the branches, appear in August when few trees are in blossom. A variety with pendulous branches is common in gardens (Loudon, *Arb. Brit.* ii. 564, t.).

The wood of *Sophora Japonica* is pale brown, tough, and durable, although light and coarse-grained, the layers of annual growth being marked by broad bands of open cells. When first cut it possesses cathartic properties which make it dangerous to work until thoroughly seasoned (*Nouveau Duhamel, l. c.*).

[19] *Bot. Mag.* t. 1442, 3735. — *Bot. Reg.* 738, 1708. — *Gard. Chron.* n. ser. ix. 729. — Nicholson, *Dict. Gard.* — Naudin, *Manuel de l'Acclimateur*, 502.

[20] De Candolle, *Ann. Sci. Nat.* iv. 98; *Prodr.* ii. 95. — Hooker f. *Fl. Brit. Ind.* ii. 249.

S. velutina, Lindley, *Bot. Reg.* t. 1185.

[21] Linnæus, *Spec.* 373. — De Candolle, *l. c.* 96. — Hooker f. *l. c.* 250.

Insects are not known to injure the North American species of Sophora, which are not subject to serious fungal diseases.[1]

The generic name was formed by Linnæus from *Sophera*, the Arabic name of some tree with pea-shaped flowers.[2]

[1] Species of *Uromyces* of the order of Rusts which abound on herbaceous *Leguminosæ* are sometimes found on *Sophora sericea*, Nuttall, and may be expected to occur on the allied arborescent *Sophora affinis*.

[2] *Hort. Cliff.* 156.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Flowers in terminal racemes; legume woody; seeds destitute of albumen; leaves persistent . 1. S. SECUNDIFLORA.
Flowers in axillary racemes; legume fleshy; seeds albuminous; leaves deciduous . . . . 2. S. AFFINIS.

SOPHORA SECUNDIFLORA.

Frijolito. Coral Bean.

FLOWERS in terminal secund racemes; stamens free. Legume woody. Leaves 7 to 9-foliolate, persistent.

Sophora secundiflora, De Candolle, *Cat. Hort. Monsp.* 148; *Prodr.* ii. 96. — Don, *Gen. Syst.* ii. 110. — Hemsley, *Bot. Biol. Am. Cent.* i. 321. — Watson, *Proc. Am. Acad.* xvii. 347. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 57. — Coulter *Contrib. U. S. Nat. Herb.* ii. 72 (*Man. Pl. W. Texas*).

Broussonetia secundiflora, Ortega, *Dec.* v. 61, t. 7.

Virgilia secundiflora, Cavanilles, *Icon.* v. 1, t. 401.

Agastianis secundiflora, Rafinesque, *New Fl.* iii. 85.

Dermatophyllum speciosum, Scheele, *Linnæa*, xxi. 459.

S. speciosa, Bentham, *Bost. Soc. Nat. Hist.* vi. 178 (*Pl. Lindheim.* ii.). — Gray, *Smithsonian Contrib.* iii. 54 (*Pl. Wright.* i.). — Walpers, *Ann.* ii. 439. — Torrey, *Bot. Mex. Bound. Surv.* 58.

A small tree, twenty-five to thirty-five feet in height, with a straight slender trunk six or eight inches in diameter, separating, several feet from the ground, into a number of upright branches which form a narrow head; or more often a shrub sending up from the ground a cluster of low stems. The bark of the trunk is half an inch thick, with a dark red-brown surface which separates into long thin narrow scales. The branchlets are at first coated with fine hoary tomentum which gradually disappears, and in their second year are glabrous or nearly so and covered with pale orange-brown bark. The leaves, which appear in February and March, are at first covered, especially on the lower surface of the leaflets, with silky white hairs; at maturity they are from four to six inches in length, with stout puberulous petioles slightly enlarged at the base, and, like the broad rachises, deeply grooved on the upper side; the leaflets are elliptical-oblong, rounded, emarginate, or sometimes mucronate at the apex, and gradually contracted at the base into short and very thick petiolules; they are destitute of stipels, thick and coriaceous, dark yellow-green above and rather paler below, glabrous or sometimes slightly puberulous along the under surface of the stout midribs, and entire with thickened margins. They are conspicuously reticulate-veined, and vary from an inch to two inches and a half in length, and from half an inch to an inch and a half in breadth. The flowers, which emit a powerful and delicious fragrance not unlike that of violets, appear with the young leaves in early spring; they are an inch long and are produced in one-sided canescent racemes two or three inches in length on stout pedicels sometimes an inch long developed from the axils of subulate deciduous bracts half an inch or more in length, and furnished near the middle with two acute bractlets broad at the base and rounded on the back. The calyx is campanulate and slightly enlarged on the upper side, the three lower teeth triangular and nearly equal, the two upper rather larger and connate almost throughout. The petals are shortly unguiculate and violet-blue, the broad erect standard being marked on the inner surface near the base with a few darker spots. The ovary is coated with long silky white hairs, which as the legume enlarges develop into dense thick white tomentum which covers the ripe fruit. This varies from one to seven inches in length and is half an inch in breadth, stalked, and crowned with the thickened remnants of the style; it is indehiscent, from one to seven-seeded, and conspicuously contracted between the seeds, with hard woody walls a quarter of an inch in thickness. The seeds, each of which is inclosed in a separate cell with thin dry walls, are oblong, rounded, half an inch in length, and bright scarlet, with a small pale hilum and bony testa, the thick inner coat being conspicuously lighter colored. The seed is destitute of albumen, the thick orange-colored cotyledons filling its cavity.

Sophora secundiflora is found on the shores of Matagorda Bay in Texas to the mountain cañons of New Mexico, and to those of Nuevo Leon and of San Luis Potosí. It usually occupies the borders

of streams, often forming broad thickets or small groves in low rather moist limestone soil, and reaches its greatest size in the neighborhood of Matagorda Bay. Farther south and west, especially west of the Pecos River, it is rarely more than a shrub.

The wood of *Sophora secundiflora* is very heavy, hard, and close-grained, with numerous thin medullary rays and a compact satiny surface: it is orange-colored streaked with red. The sapwood is thick, bright yellow, and composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.9842, a cubic foot weighing 61.34 pounds. It is valuable as fuel.

Sophora secundiflora was first noticed in Texas by Lindheimer[1] in the neighborhood of New Braunfels and on the shores of Matagorda Bay. It appears to have been introduced into the Botanic Garden at Madrid towards the end of the last century, and the earliest description, that of Ortega, was drawn up from the cultivated plant; it was in cultivation in the Jardin des Plantes in Paris[2] in 1854, and is occasionally found in the gardens of southern Europe.

Sophora secundiflora is one of the handsomest of the small trees of the Texas forests; its lustrous persistent foliage, large and fragrant flowers, conspicuous fruit, and brilliant seeds make it a desirable garden ornament in all regions where the climate is sufficiently temperate to develop its beauties.

[1] See i. 74. [2] *Rev. Hort.* 1854, 201, f. 11.

EXPLANATION OF THE PLATE.

PLATE CXXI. SOPHORA SECUNDIFLORA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. A calyx, enlarged.
5. A flower, a portion of the calyx and the petals removed, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A cluster of fruit, natural size.
10. Vertical section of a legume, natural size.
11. Vertical section of a seed, natural size.
12. An embryo, enlarged.

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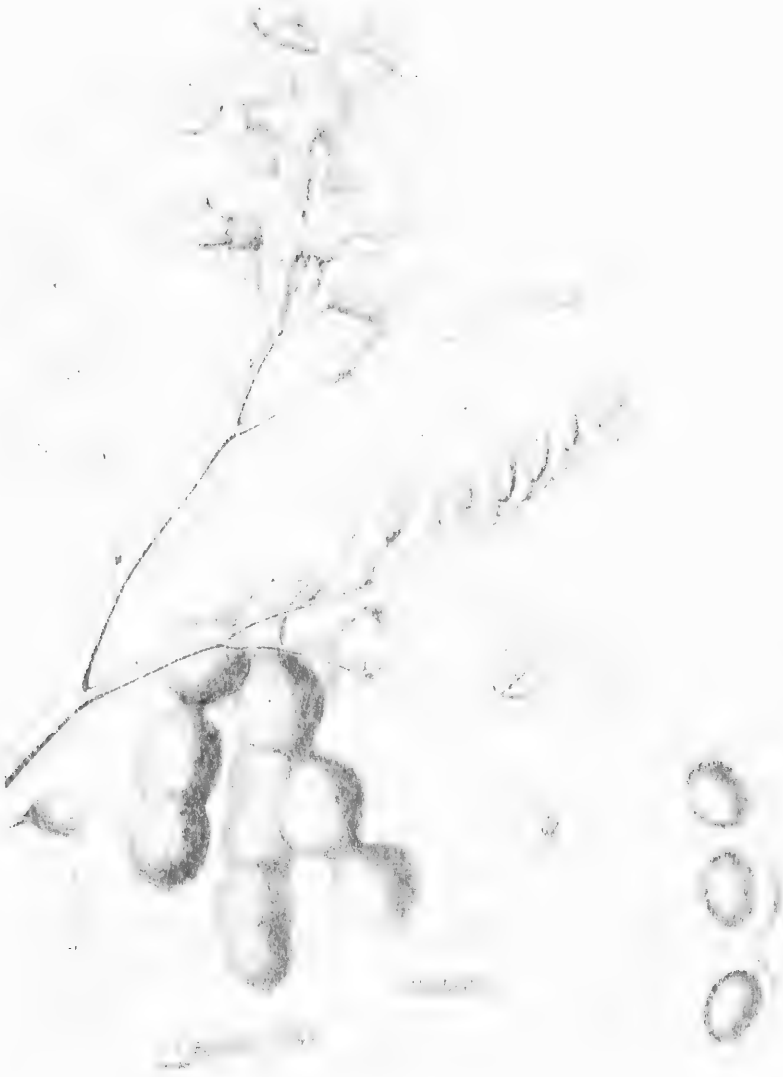
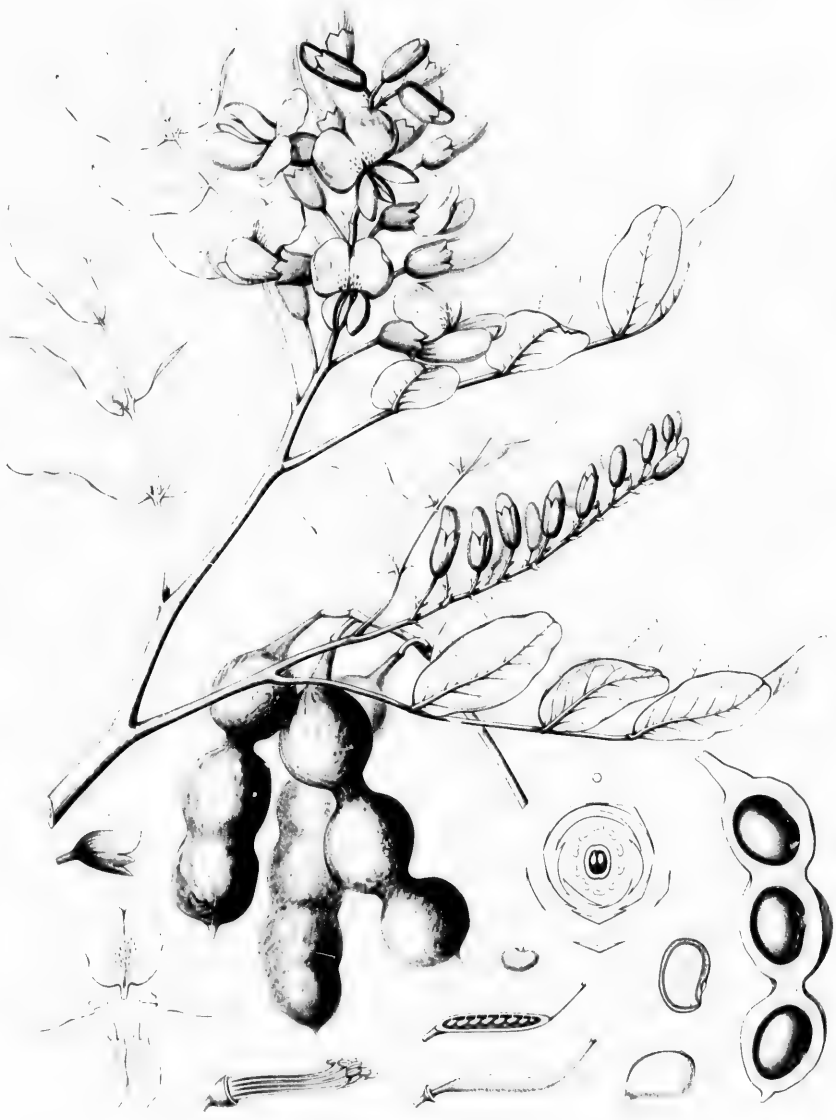




SOPHORA CHRYSOPHYLLA

SOPHORA AFFINIS.

FLOWERS in axillary racemes; stamens slightly connate at the base, the posterior one free. Legume fleshy. Leaves 13 to 19-foliolate, deciduous.

Sophora affinis, Torrey & Gray, *Fl. N. Am.* i. 390. — Leavenworth, *Am. Jour. Sci.* xlix. 130. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 178 (*Pl. Lindheim.* ii.). — Scheele, *Roemer Texas*, 428. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 58. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 72 (*Man. Pl. W. Texas*).
Styphnolobium affine, Walpers, *Rep.* i. 807.

A small tree, eighteen or twenty feet in height, with a trunk eight or ten inches in diameter, dividing into a number of stout spreading branches forming a handsome round head, slender terete slightly zigzag branchlets, and thick orange-colored roots. The bark of the trunk is an eighth of an inch thick, dark reddish brown, and broken into numerous oblong scales, the surface exfoliating in thin layers. The buds are depressed, minute, almost surrounded by the base of the petioles, and are covered with broad scales which are coated on the outside with dark brown and on the inside with longer pale tomentum, and which are persistent on the base of the growing shoots. The branchlets are at first orange-brown or dark green and slightly puberulous, and in their second year are bright green marked by narrow brown ridges and with large leaf-scars and occasional dark-colored lenticular spots. The leaves, which appear in March and April, are at first coated on both surfaces with hoary pubescence; they are six to nine inches long, with slender puberulous petioles and rachises slightly grooved on the upper side. The leaflets are elliptical, obtuse or retuse, slightly mucronate, and contracted at the base into short stout pubescent petiolules; they are entire with slightly wavy thickened margins, membranaceous, pale yellow-green and glabrous on the upper surface, paler and covered with scattered hairs or nearly glabrous on the lower surface, and are from an inch to an inch and a half in length and half an inch in breadth, with prominent orange-colored midribs grooved on the upper side, slender primary veins, and conspicuous reticulated veinlets. The flowers appear in early spring with the new growth in slender axillary pubescent semipendent racemes forming conspicuous panicles at the ends of the branches, and are half an inch in length or rather longer than the slender canescent pedicels produced from the axils of minute deciduous bracts. The calyx is short, campanulate, abruptly narrowed at the base, somewhat enlarged on the upper side, and slightly pubescent, especially on the margins of the short nearly triangular teeth. The petals are shortly unguiculate, and are white tinged with rose-color; the standard is nearly orbicular, slightly emarginate, reflexed, as long and twice as broad as the ovate auriculate wings and keel-petals. The ovary is conspicuously stipitate and villose. The legumes, which vary from half an inch to three inches in length, are indehiscent, black, and more or less pubescent, and are crowned with the thickened remnants of the styles; they are four to eight or by abortion one-seeded and then subglobose; the walls are fleshy, and when fully ripe rather sweet like those of the cells inclosing the seeds. The fruit is produced in great abundance, and hangs on the branches during the winter. The seeds are oval, slightly compressed, and scarcely strophiolate, with a thin crustaceous bright chestnut-brown testa. The cotyledons, which are surrounded by a thin layer of horny albumen, are bright green; the radicle is long and incurved.

Sophora affinis inhabits the region between the valley of the Arkansas River in Arkansas and that of the San Antonio in Texas, extending westward in Texas to the upper waters of the Colorado River. It is usually found on limestone hills or along the margins of streams or of ravines or depressions in the prairie, where it often forms small groves with Oaks, Elms, Redbuds, Viburnums, and Hawthorns.

The wood of *Sophora affinis* is heavy and very hard and strong although coarse-grained, the layers of annual growth being marked by several rows of large open ducts. It contains thin conspicuous medullary rays, and is light red in color, the thick sapwood composed of ten or twelve layers of annual growth, being bright clear yellow. The specific gravity of the absolutely dry wood is 0.8509, a cubic foot weighing 53.03 pounds.

Ink is sometimes made domestically of the resinous exudations from the fruit.

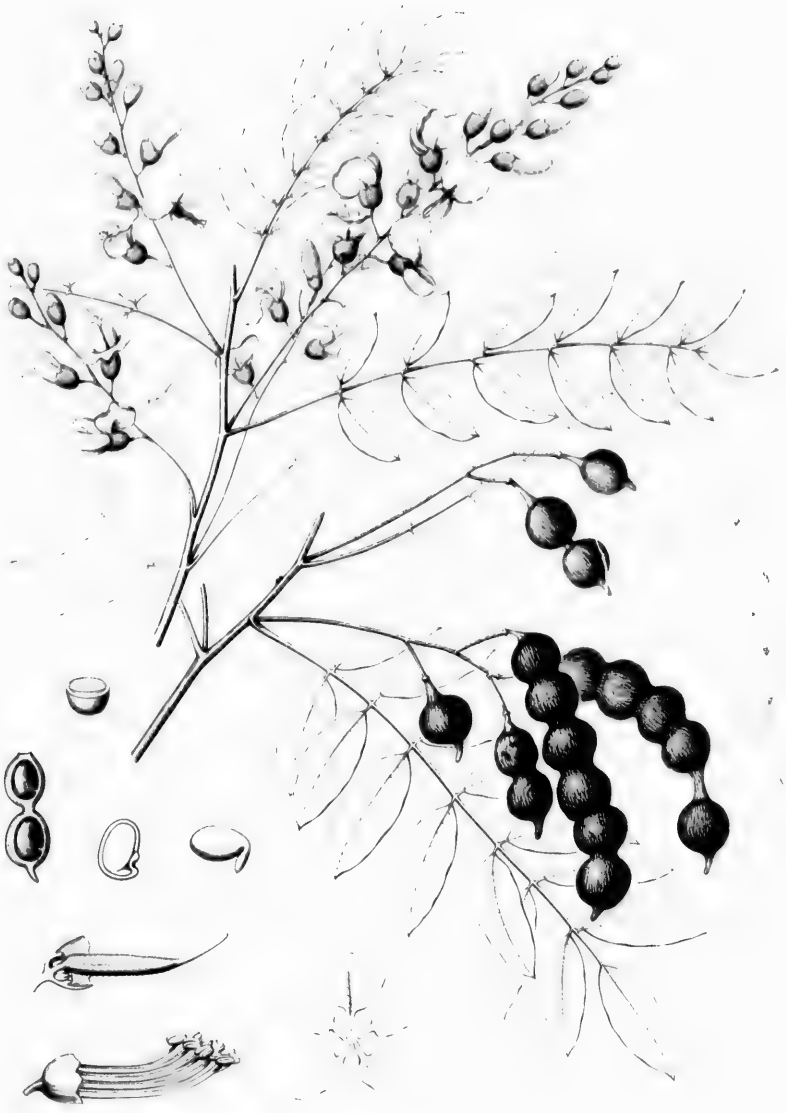
Sophora affinis was discovered in the valley of the Red River in Arkansas by Dr. M. C. Leavenworth[1] in 1821; and was introduced into cultivation through the Arnold Arboretum in 1890.

[1] Mellins C. Leavenworth was born in Connecticut early in the century. He served in the United States army as acting assistant-surgeon in 1831 and 1832, and was appointed assistant-surgeon in 1833, continuing his connection with the army until 1840. At frontier posts in Arkansas, Louisiana, and Florida, Dr. Leavenworth was able to gratify a taste for botany, for which he did useful service by observing and collecting the plants within his reach. These he communicated to Dr. Torrey with copious notes. Dr. Leavenworth was appointed assistant-surgeon of the 12th Regiment of Connecticut Volunteers, December, 1861, and died near New Orleans, November 16, 1863, while serving in the Department of the Gulf. Dr. Leavenworth was the author of a few short botanical papers printed in the *American Journal of Science and Arts*. In the earliest of these, published in 1824, four new species of plants discovered by the author in northern Alabama are described; and in others are recorded some of the results of his wide and careful observations. *Leavenworthia*, a genus of Cruciferous plants, was dedicated to him by Torrey.

EXPLANATION OF THE PLATE.

PLATE CXXII. SOPHORA AFFINIS.

1. A flowering branch, natural size.
2. The petals of a flower displayed, enlarged.
3. A flower, the corolla removed, enlarged.
4. A pistil, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a portion of a fruit, natural size.
7. Vertical section of a seed, enlarged.
8. An embryo, enlarged.
9. Cross section of a seed, enlarged.
10. A winter branchlet, natural size.



SOPHORA AFFINIS

GYMNOCLADUS.

Flowers regular, diœcious by abortion; calyx tubular, disciferous, 5-lobed, the lobes valvate in æstivation; petals 4 or 5, imbricated in æstivation; ovary sessile or slightly stipitate, 4 or many-ovuled. Legume turgid or compressed, woody, 2-valved. Leaves unequally bipinnate.

Gymnocladus, Lamarck, *Dict.* i. 733 (in part). — A. L. de Jussieu, *Gen.* 346. — Meisner, *Gen.* 98. — Endlicher, *Gen.* 1311. — Bentham & Hooker, *Gen.* i. 568. — Baillon, *Hist. Pl.* ii. 175.

Guilandina, Linnæus, *Gen.* ed. 2, 518 (in part).

Hyperanthera, Vahl, *Symb.* i. 30 (in part).

Trees, with stout unarmed blunt pithy branches, rough deeply fissured bark, and thick fleshy roots. Buds minute, depressed in pubescent cavities of the stem, two in the axil of each leaf, superposed, remote, the lower and smaller sterile and nearly surrounded by the enlarged base of the petiole; bud-scales two, ovate, rounded at the apex, coated with thick dark brown tomentum, infolded one over the other, accrescent with the young shoots. Leaves deciduous, alternate, bipinnate; pinnæ and leaflets usually alternate; stipules ample, foliaceous, early deciduous; leaflets membranaceous, ovate, entire, petiolulate. Inflorescence terminal or axillary, leafy or bracted towards the base, that of the staminate plant a short racemose corymb, of the pistillate plant an elongated raceme. Flowers greenish white, long-pedicellate, the slender pedicels developed from the axils of long lanceolate scarious caducous bracts, and furnished near the middle with two minute deciduous bractlets. Calyx tubular, elongated, ten-ribbed, lined with the thin glandular disk, five-lobed, the lobes lanceolate, acute, nearly equal, erect. Petals oblong, rounded or acute at the apex, pubescent, as long as the calyx-lobes or rather longer and twice as broad, inserted on the margin of the disk, spreading or reflexed. Stamens ten, free, inserted on the margin of the disk, erect, included; filaments filiform, pilose, those opposite the petals shorter than the others; anthers oblong, uniform, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally; smaller and sterile in the pistillate flower. Ovary sessile in the bottom of the calyx-tube or slightly stipitate, acute, pilose, or glabrous, many-ovuled; style short, erect, obliquely dilated into two broad stigmatic lobes, or, in the Chinese species, contracted into a slightly oblique capitate stigma; rudimentary or wanting in the sterile flower; ovules suspended from the angle opposite the posterior petal, superposed, anatropous, the micropyle superior. Legume oblong, subfalcate, turgid, or slightly compressed, several-seeded, tardily dehiscent, two-valved, the woody valves thickened on the margins into narrow wings, pulpy between the seeds. Seed ovoid, slightly obovoid or subglobose, suspended by a long slender funicle; testa thick, bony, three-coated, brown, and opaque. Embryo surrounded by a thin layer of horny albumen; cotyledons ovate, thick and fleshy, the radicle short, erect.

Gymnocladus is now confined to the temperate parts of eastern North America and to southern China, although there is evidence that it existed in Europe during the Tertiary period.[1] Only two species are known. *Gymnocladus dioicus*, the type of the genus, inhabits America, and *Gymnocladus Chinensis*[2] several of the southern and southwestern provinces of China.

Gymnocladus is slightly astringent and purgative. The seeds of *Gymnocladus dioicus* were

[1] Saporta, *Origine Paléontologique des Arbres*, 20.

[2] Baillon, *Compt. Rend. Assoc. Franc. pour l'Avanc. Sci.* 1874, 418, t. 4; *Bull. Soc. Linn. Par.* 1875, 33; *Dict. Bot.* i. 781. — Oliver, *Hooker Icon.* xv. 9, t. 1412. — Hemsley, *Jour. Linn. Soc.* xxiii. 208; *Garden and Forest*, ii. 260. — Nicholson, *Garden and Forest*, ii. 139.

once used in some parts of the United States as a substitute for coffee; a decoction of the fresh green pulp of the unripe fruit is used in homœopathic practice,[1] and the bruised leaves are said to destroy insects feeding on them.[2] The seeds of the Asiatic species are surrounded by a detersive pulp which is used by the Chinese as a substitute for soap in washing linen and cleaning the human head.[3]

The generic name, from γυμνός, and χλάδος, relates to the stout branches destitute of spray.

[1] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 53, t. 53.

[2] See Millspaugh, *l. c.*

[3] Bretschneider, *Notes on some Botanical Questions connected with the Export Trade of China*, 14. — Hanbury *Science Papers*, 228, f. 5.

GYMNOCLADUS DIOICUS.

Kentucky Coffee Tree.

INFLORESCENCE terminal. Leaves 10 to 14-pinnate, the lowest pinnæ reduced to simple leaflets, the others 7 to 13-foliolate.

Gymnocladus dioicus, Koch, *Dendr.* i. 5. — Baillon, *Hist. Pl* ii. 88, f. 52, 53; *Dict.* i. 781. — Sargent, *Garden and Forest*, ii. 375.

Guilandina dioica, Linnæus, *Spec.* 381. — Marshall, *Arbust. Am.* 56.

Gymnocladus Canadensis, Lamarck, *Dict.* i. 733; *Ill.* iii. 412, t. 823. — Michaux, *Fl. Bor.-Am.* ii. 241, t. 51. — Willdenow, *Spec.* iv. 816; *Enum.* 1019; *Berl. Baumz.* 169. — Persoon, *Syn.* ii. 626. — Desfontaines, *Hist. Arb.* ii. 250. — Michaux f. *Hist. Arb. Am.* ii. 272, t. 23. — Pursh, *Fl. Am. Sept.* i. 304. — Nuttall, *Gen.* ii. 243. — Hayne, *Dendr. Fl.* 203. — Reichenbach, *Mag. Bot.* t. 40. — De Candolle, *Prodr.* ii. 480. — Sprengel, *Syst.* ii. 327. — Torrey, *Fl. N. Y.* i. 191; *Emory's Rep.* 407. — Hooker, *Fl. Bor.-Am.* i. 166. — Don, *Gen. Syst.* ii. 429. — Spach, *Hist. Vég.* i. 89. — Torrey & Gray, *Fl. N. Am.* i. 398. — Walpers, *Rep.* i. 809. — Bell, *Rep. Geolog. Surv. Can.* 1879–80, 54. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 63. — Chapman, *Fl.* ed. 2, Suppl. 618. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 58. — Watson & Coulter, *Gray's Man.* ed. 6, 148.

Hyperanthera dioica, Vahl, *Symb.* i. 31.

A tree, seventy-five to one hundred and ten feet in height, with a trunk two or three feet in diameter, usually separating, ten or fifteen feet from the ground, into three or four principal divisions which spread slightly and form a narrow pyramidal head; or occasionally sending up a tall straight shaft destitute of branches for seventy or eighty feet. The bark of the trunk is from three quarters of an inch to an inch in thickness and deeply fissured, the dark gray surface being tinged with red and roughened by small persistent scales. The branchlets when they first appear are coated with short thick pubescence faintly tinged with red, and bear at their bases until nearly grown the conspicuous orange-green pubescent bud-scales which at maturity are broadly obovate, rounded at the apex, and an inch long. At the end of the first season the branchlets are a quarter to a third of an inch thick, very blunt, and composed of a thick core of light orange-brown pith surrounded by a thin layer of bright yellow wood covered with bright green astringent inner bark and thin dark brown often slightly pilose outer bark marked by orange-colored lenticular spots and large pale broadly heart-shaped leaf-scars. The leaves are from one to three feet in length and eighteen to twenty-four inches in breadth, and are obovate in outline by the greater development of the upper pairs of pinnæ; and are covered when they unfold with hoary tomentum, except on the upper surfaces of the leaflets. The leaf-stalks and those of the pinnæ are terete, abruptly and conspicuously enlarged at the base, glabrous at maturity, and pale green or frequently purple on the upper side. The stipules are foliaceous, lanceolate, or slightly obovate, glandular-serrate towards the apex, a third of an inch in length, and deciduous. The leaflets are pink at first but soon become bronze-green, and are lustrous and glabrous on the upper surface with the exception of a few scattered hairs along the midribs;[1] when fully grown they are from two to two and a half inches in length and an inch in breadth, or those which replace the lower or occasionally the two lower pairs of pinnæ sometimes twice as large; they are membranaceous, obscurely veined, ovate, acute, or often mucronate, especially while young, wedge-shaped or irregularly rounded at the base by the greater development of the upper side, dark green above, pale yellow-green below, and glabrous with the exception of a few soft hairs scattered along the narrow midribs, the entire slightly thickened and revolute wavy margins, and the short stout petiolules. The leaves appear about the middle

[1] The trees are conspicuous at the time the leaves are expanding by the contrast of colors furnished by the leaflets. Those near the ends of the leaves are bright pink, while those on the lower pinnæ which had opened first are green or bronze-colored.

of May or after most of the deciduous trees of the American forests have covered themselves with foliage,[1] and in the autumn turn a bright clear yellow. The inflorescence of the sterile tree is three or four inches in length, the lower branches, which are somewhat swollen at the base, being usually three or four-flowered. The inflorescence of the female tree is ten or twelve inches long, the flowers being borne on stout pedicels from an inch to two and a half inches in length, or from twice to five times the length of those of the staminate flowers. The calyx is two thirds of an inch long, conspicuously ten-ribbed and clothed in the bud, like the petioles and the exterior surface of the petals, with thick white tomentum; when the flowers are expanded they are covered on the outer surface with pale hairs, and on the inner surface with thick pale tomentum. The petals are keeled, pilose on the back, slightly grooved, and clothed with tomentum on the inner surface, and are rather longer than the calyx-lobes and about twice as broad. The anthers are bright orange-colored. The ovary is sessile, covered with hairs, many-ovuled, and contracted into a short style dilated above into two broad lobes stigmatic on their inner surface. The legumes, which hang unopened on the branches throughout the winter, are subfalcate, with more or less thickened margins, six to ten inches in length, an inch and a half to two inches in breadth, and dark reddish brown covered with a slight glaucous bloom; they are borne on stout stalks an inch or two long, and are crowned with the thickened pointed remnants of the styles. Their valves are thin, tough, and woody, and contain between the seeds a thick layer of dark-colored sweet pulp. The seeds are three quarters of an inch long, ovate, or slightly obovate and compressed, with a hard bony coat and albumen, and orange-colored cotyledons.

Gymnocladus dioicus is found growing spontaneously on the shores of Cayuga and Seneca Lakes in New York[2] and on the banks of Conococheague Creek in Franklin County, Pennsylvania;[3] it extends westward through southern Ontario[4] and southern Michigan to the valley of the Minnesota River, to eastern Nebraska, eastern Kansas, and southwestern Arkansas, and to about longitude 96° west in the Indian Territory, and southward between the Alleghany Mountains and the Mississippi River to middle Tennessee. Although distributed over a wide area, *Gymnocladus dioicus* is one of the rarest of the forest trees of eastern North America. It selects bottom-lands and the richest soil, where it grows in company with the Black Walnut, the Blue Ash, the Hackberry, the Cottonwood, the Honey Locust, the Red Elm, and the Hickories.

The wood of *Gymnocladus dioicus* is heavy although not very hard, strong, coarse-grained, liable to check in drying, and very durable in contact with the ground; it can be easily worked, and the surface will take a good polish. It contains many thin medullary rays, and bands of one or two rows of open ducts marking the layers of annual growth. It is rich light brown in color, tinged with red, the thin sapwood composed of five or six layers of annual growth, being rather lighter colored than the heartwood. The specific gravity of the absolutely dry wood is 0.6634, a cubic foot weighing 43.21 pounds. It is occasionally used in cabinet-making, and for fence-posts, rails, and in construction.

Gymnocladus dioicus, mentioned by Linnæus[5] in 1742 as growing in Paris, was first described by Duhamel in the *Traité des Arbres*[6] published in 1755; according to Aiton[7] it was cultivated in England in 1748 by the Duke of Argyll.[8]

Gymnocladus dioicus is now a familiar inhabitant of the gardens and parks of the United States[9] and of northern and central Europe, and is valued for its hardiness, rapid growth, and good habit, for the singular appearance that its naked branches present in winter, for the lightness, grace, and cheerful color of its great leaves, and for its immunity from disease.

[1] The stout dark-colored branchlets destitute of spray give to Gymnocladus in winter and especially in spring the appearance of a dead tree. This appearance has caused it to be called *Chicot* (Branche morte ou recouverte de chancres) by the French settlers in America, and it is by this name that it is now known in France.

[2] Dudley, *Bull. Cornell Univ.* ii. 26 (*Cayuga Fl.*).

[3] Where it was discovered by Professor T. C. Porter.

[4] Brunet, *Cat. Veg. Lig. Can.* 19. — Macoun, *Cat. Can. Pl.* 512.

[5] *Gen.* ed. 2, 518.

[6] *Bonduc Canadense polyphyllum, non spinosum mas & fœmina*, i. 108, t. 42.

[7] *Hort. Kew.* ed. 2, v. 400. — Loudon, *Arb. Brit.* ii. 656, t.

[8] See i. 108.

[9] *Garden and Forest*, ii. 75, f. 10.

The Kentucky Coffee-tree, as it is almost universally called in the United States and in England, from the use which at one time was made of the seeds, is not at all particular about the character of the soil in which it is planted, although it will not grow rapidly or to a great size except in deep rich and rather humid loam. It may be propagated by seeds which the pistillate plants produce rather sparingly, and which sometimes do not germinate until the second or third years, and more easily and quickly from cuttings made from pieces of the roots, which soon form rootlets and grow with vigor.[1]

[1] Briot, *Rev. Hort.* 1870, 436.

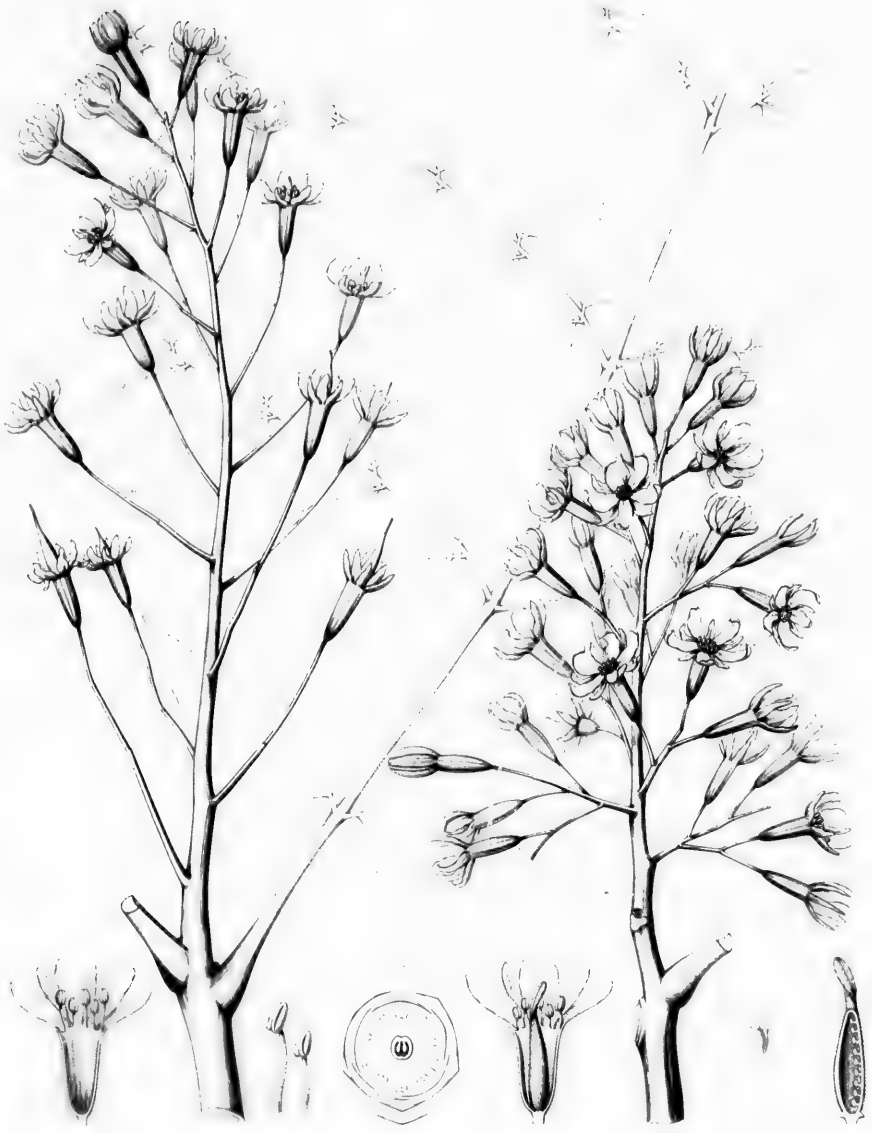
EXPLANATION OF THE PLATES.

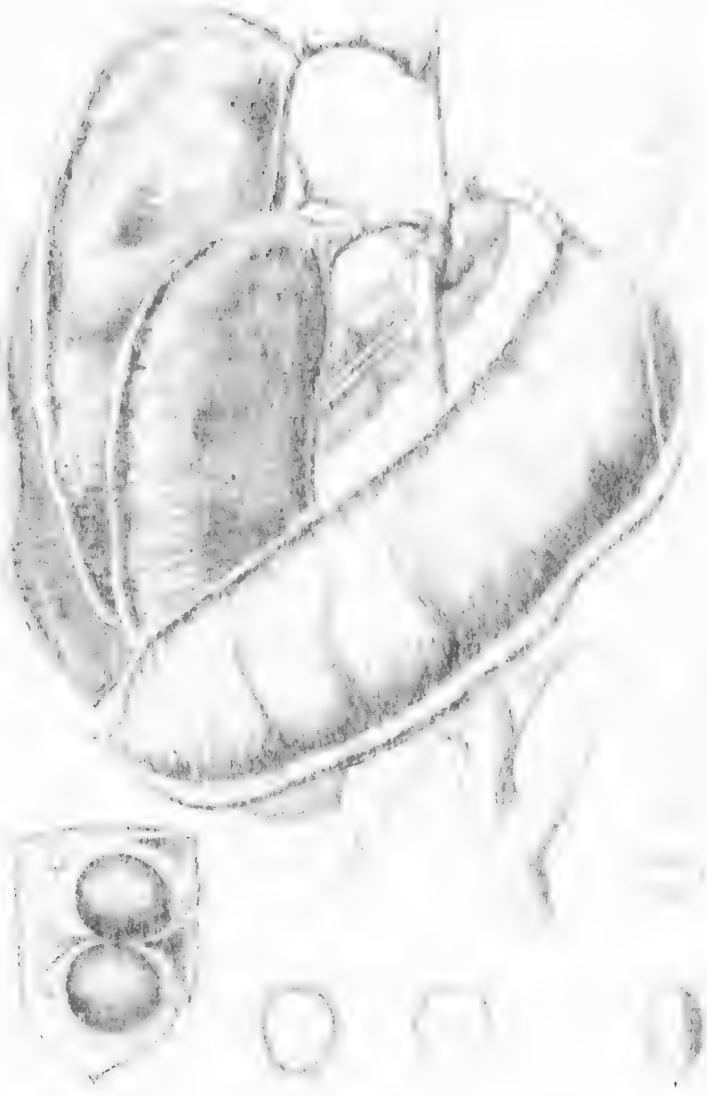
Plate CXXIII. Gymnocladus dioicus.

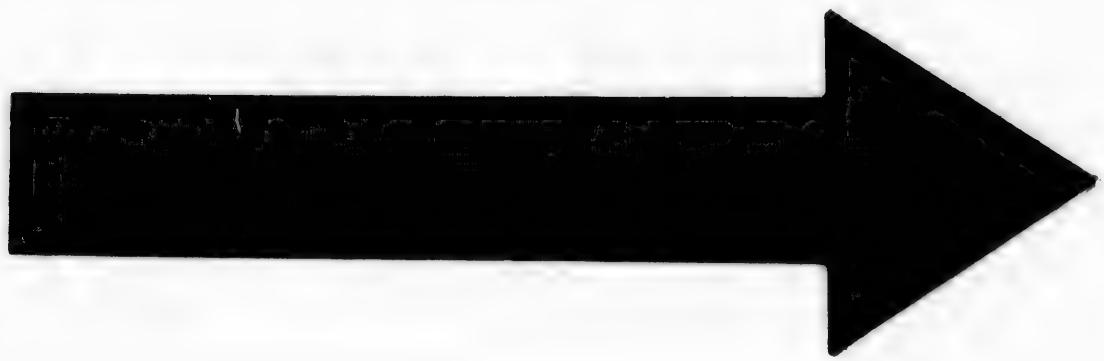
1. An inflorescence of the staminate tree, natural size.
2. An inflorescence of the pistillate tree, natural size.
3. Diagram of a flower.
4. Vertical section of a staminate flower, enlarged.
5. Front view of a long and a short stamen, enlarged.
6. A female flower, a portion of the calyx, corolla, and stamens removed, enlarged.
7. A pistil, a vertical section of the ovary removed, enlarged.
8. An ovule, much magnified.

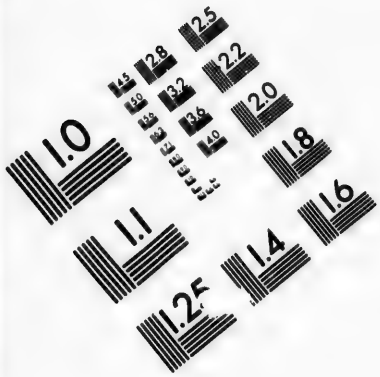
Plate CXXIV. Gymnocladus dioicus.

1. A cluster of fruit, natural size.
2. A portion of a legume, one of the valves removed, natural size.
3. A seed, natural size.
4. Vertical section of a seed, natural size.
5. Cross section of a seed, natural size.
6. An embryo, enlarged.
7. Base of a young branchlet with bud-scales and stipules, natural size.
8. A winter branchlet, natural size.









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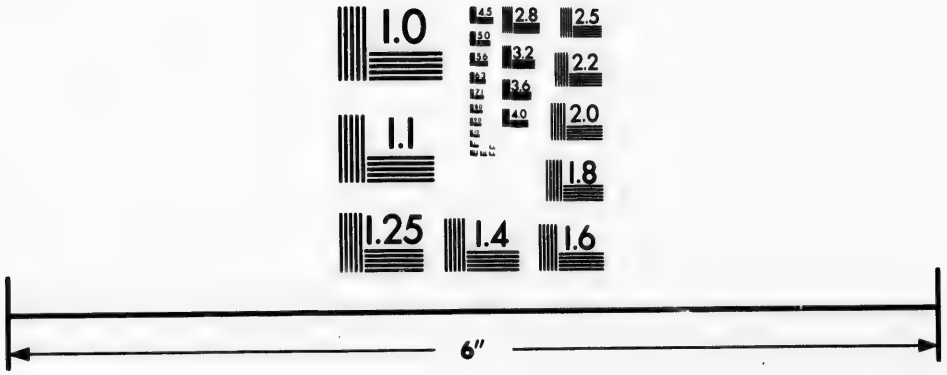

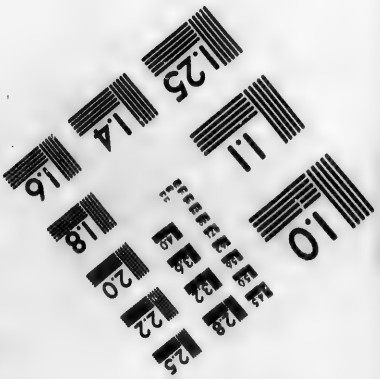

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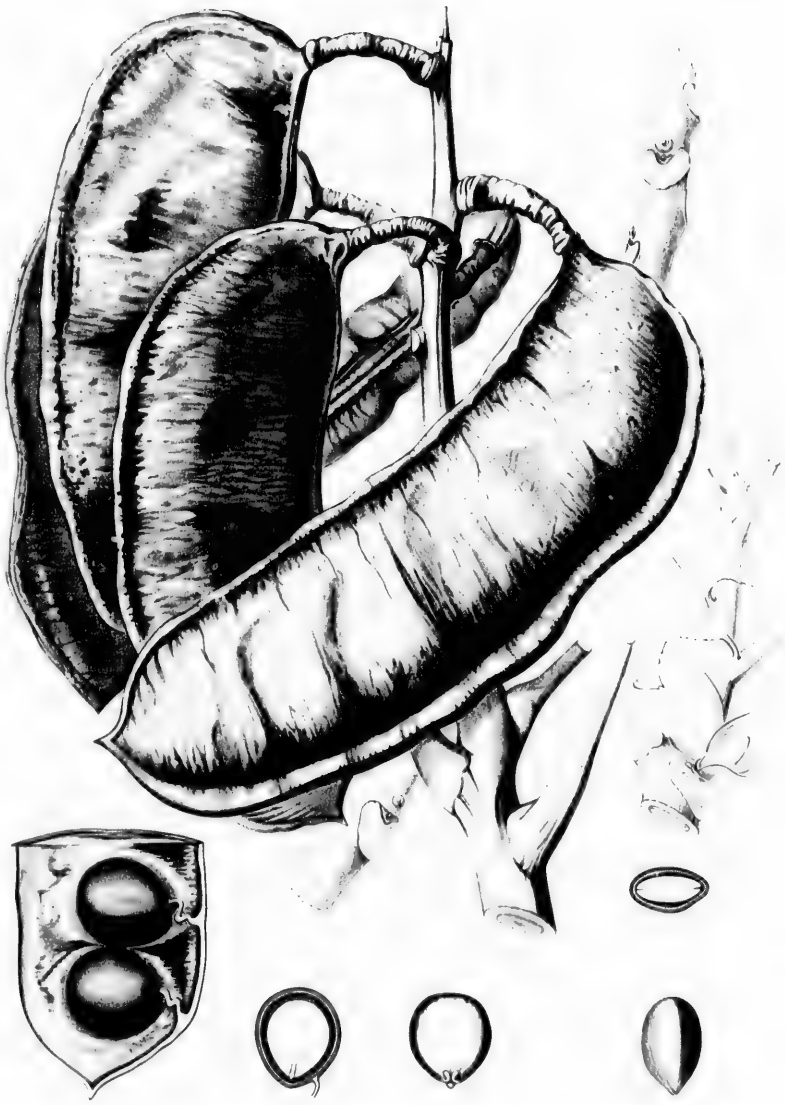


GYMNOCLADUS DIOICUS

GLEDITSIA.

FLOWERS regular, polygamous by abortion; calyx campanulate, disciferous, 3 to 5-lobed, the lobes valvate or slightly imbricated in æstivation; petals 3 or 5, imbricated in æstivation; ovary subsessile, 2 or many-ovuled. Legume indehiscent or tardily 2-valved. Leaves abruptly pinnate or bipinnate.

Gleditsia, Linnæus, *Gen.* ed. 2, 480. — Adanson, *Fam. Pl.* ii. 319. — Meisner, *Gen.* 100. — Endlicher, *Gen.* 1311. — Bentham & Hooker, *Gen.* i. 568. — Baillon, *Hist. Pl.* ii. 175.

Melilobus, Mitchell, *Act. Nat. Cur.* viii. Appx. 215. — Rafinesque, *Sylva Tellur.* 121.

Asacara, Rafinesque, *Neogen.* 2.

Trees, with furrowed bark, terete branchlets, minute subpetiolar buds, and thick fibrous roots, the branches and trunk often armed with stout simple or branched spines or abortive branches developed from supra-axillary or adventitious buds. Leaves deciduous, alternate, often fascicled in earlier axils, abruptly pinnate or bipinnate often on the same individual, the lower pinnæ sometimes reduced to single leaflets; stipules minute, caducous; leaflets membranaceous, their margins irregularly crenate, destitute of stipels. Flowers minute, green or white, short-pedicellate, in axillary or lateral simple or fascicled racemes. Bracts minute, scale-like, caducous. Calyx campanulate, lined with the disk, three to five-lobed, the narrow lobes only imperfectly inclosing the petals in the bud, nearly equal. Petals as many as the lobes of the calyx, nearly equal. Stamens six to ten, inserted with the petals on the margin of the disk, exserted; filaments free, filiform, erect; anthers uniform, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally; much smaller and abortive in the pistillate flower. Ovary inserted in the bottom of the disk, subsessile, rarely bicarpellary, rudimentary or wanting in the staminate flower; style short; stigma terminal, more or less dilated, often declinate; ovules two or many, suspended from the angle opposite the posterior petal, superposed, anatropous, the micropyle superior. Legume many or rarely one or two-seeded, elongated, straight, compressed, pulpy between the seeds, indehiscent, the walls thin and membranaceous; or ovate, destitute of pulp, and tardily dehiscent, or slightly turgid and indehiscent with hard woody walls. Seed transverse, obovate, or compressed, attached by a long slender funicle; testa thin, crustaceous, light brown. Embryo surrounded by a layer of horny albumen; cotyledons subfoliaceous, compressed; radicle short, erect, slightly exserted.

Gleditsia is represented in the flora of eastern America by two species, one of which is the type of the genus; it occurs on the mountains of west tropical Africa,[1] in the Orient,[2] and in China and Japan;[3] and in the Tertiary period existed in Europe.[4] In China four species and possibly more, as the Chinese Gleditsias are still very imperfectly known, are found scattered from the northern to the southern provinces of the empire.[5]

Many of the parts of Gleditsia are astringent, and several of the species produce strong, durable,

[1] *Gleditsia Africana*, Bentham, *Trans. Linn. Soc.* xxv. 304.

[2] *Gleditsia Caspica*, Desfontaines, *Hist. Arb.* ii. 247. — Koch, *Dendr.* i. 10. — Boissier, *Fl. Orient.* ii. 631. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxxi. 37 (*Mél. Biol.* xii. 451). This is a small tree generally distributed through the forest region of the province of Talysch south of the Caspian Sea, and in northern Persia, and is to be distinguished from *Gleditsia triacanthos* by its leaflets, which are twice as large as those of that species, and by its shorter pods.

[3] *Gleditsia Japonica*, Miquel, *Prol. Fl. Jap.* 242. — Franchet & Savatier, *Enum. Pl. Jap.* i. 114; ii. 327. — Maximowicz, *l. c.* A handsome tree, widely scattered through the empire, especially in the northern islands, where it grows near the borders of streams and in the forests which cover the lower slopes of the mountains, and is often cultivated in the neighborhood of villages.

[4] Saporta, *Origine Paléontologique des Arbres*, 20.

[5] Maximowicz, *l. c.* — Hemsley, *Jour. Linn. Soc.* xxiii. 208, t. 5; *Garden and Forest*, ii. 266.

although coarse-grained timber. The pulp which surrounds the seeds has a sweet taste when fresh, but becomes bitter and astringent. Beer has been made in the United States by fermenting the fresh pods of *Gleditsia triacanthos*,[1] and in Japan the pods of *Gleditsia Japonica* were formerly employed as soap, and once formed an article of some commercial importance.[2]

The American species are not seriously injured by insects,[3] and are subject to few fungal diseases.[4]

The generic name commemorates the scientific labors of Johann Gottlieb Gleditsch,[5] a contemporary and friend of Linnæus, and professor of botany at Berlin.

[1] Porcher, *Resources of Southern Fields and Forests*, 195.

[2] Reia, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 298.

[3] The Honey Locusts are less injured by insects than Robinia, although a borer, *Eburia quadrigeminata*, Say, is said to live in their trunks. Web-worms and some other general leaf-eating insects occur on them, and the leaves are sometimes mined by the larvæ of small moths. The larvæ of *Pempelia gleditschiella*, Fernald, are described as drawing the leaves together and feeding on them (*Rep. Dept. Agric.* 1880, 262). In some parts of the country they are injured by the maggots of *Cecidomyia gleditschiæ*, Osten Sacken, which distort the young leaflets and prevent their development (*Proc. Entomol. Soc. Phil.* vi. 219).

[4] The leaves of Gleditsia are sometimes injured in the United States by *Leptostroma hypophyllum*, Berk. & Rav., which appears in the form of small black spots, and by the mildew *Microsphæria Ravenelii*, Berk., which produces velvety olive-colored patches on the leaves. Of the fungi which attack the stems the most important are *Botryosphæria Gleditschiæ*, Sacc., *Sphæropsis Gleditschiæ*, Cooke, and *Sphæropsis mamillaris*, B. & C., but they are not known to cause serious injury.

[5] Johann Gottlieb Gleditsch (1714–1786), a native of Leipsic, was appointed in 1771 to the chair of botany in the University of Berlin, which he occupied during the remainder of his life. He wrote numerous botanical treatises and one of the earliest works on scientific forestry, his chief merit as an author being the application of botanical methods to rural science.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Legume linear-oblong, elongated, many-seeded, pulpy, indehiscent; leaflets lanceolate-oblong	1. G. TRIACANTHOS.
Legume oval, oblique, one or two-seeded, without pulp, tardily dehiscent; leaflets ovate, oblique	2. G. AQUATICA.

GLEDITSIA TRIACANTHOS.

Honey Locust. Three Thorned Acacia.

LEGUME linear-oblong, elongated, many-seeded, pulpy, indehiscent. Leaflets lanceolate-oblong.

Gleditsia triacanthos, Linnæus, *Spec.* 1056. — Miller, *Dict.* ed. 8, No. 1. — Du Roi, *Harbk. Baum.* i. 294. — Medicus, *Bot. Beob.* 1782, 230. — Wangenheim, *Nordam. Holz.* 81. — Castiglioni, *Viag. negli Stati Uniti*, ii. 249. — Lamarck, *Dict.* ii. 465; *Ill.* iii. 446, t. 857, f. 1. — Moench, *Meth.* 69. — Abbot, *Insects of Georgia*, ii. t. 85. — Michaux, *Fl. Bor.-Am.* ii. 257. — Schkuhr, *Handb.* iv. 346, t. 356. — Persoon, *Syn.* ii. 623. — Desfontaines, *Hist. Arb.* ii. 246. — Willdenow, *Spec.* iv. 1097; *Enum.* 1058; *Berl. Baumz.* 163. — *Nouveau Duhamel*, iv. 100, t. 25. — Michaux f. *Hist. Arb. Am.* iii. 164, t. 10. — Pursh, *Fl. Am. Sept.* i. 221. — Nuttall, *Gen.* ii. 239. — James, *Long's Exped.* i. 138. — Hayne, *Dendr. Fl.* 218. — Elliott, *Sk.* ii. 709. — Guimpel, Otto & Hayne, *Abbild. Holz.* 157, t. 132. — De Candolle, *Prodr.* ii. 479. — Watson, *Dendr. Brit.* ii. 138, t. 138. — Sprengel, *Syst.* iii. 918. — Torrey, *Fl. N. Y.* i. 192. — Audubon, *Birds*, t. 42, 146, 150. — Jaume St. Hilaire, *Traité des Arbres*, t. 31. — Roemer & Schultes, *Syst.* vii. 73. — Don, *Gen. Syst.* ii. 428. — Spach, *Hist. Vég.* i. 92. — Torrey & Gray, *Fl. N. Am.* i. 398. — Dietrich, *Syn.* v. 539. — Chapman, *Fl.* 115. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 49. — Koch, *Dendr.* i. 8. — Brunet, *Cat. Vég. Lig. Can.* 20. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 59. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxxi. 37 (*Mél. Biol.* xii. 451). — Watson & Coulter, *Gray's Man.* ed. 6, 149. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

G. spinosa, Marshall, *Arbust. Am.* 54.

G. Meliloba, Walter, *Fl. Car.* 254.

G. ferox, Desfontaines, *Hist. Arb.* ii. 247. — Sprengel, *Syst.* iii. 919. — Don, *Gen. Syst.* ii. 428. — Spach, *Hist. Vég.* i. 94. — Dietrich, *Syn.* v. 539.

G. elegans, Salisbury, *Prodr.* 323.

G. heterophylla, Rafinesque, *Fl. Ludovic.* 99.

Melilobus heterophylla, Rafinesque, *Sylva Tellur.* 121.

A tree, seventy-five to one hundred and forty feet in height, with a trunk two or three or occasionally five or six feet in diameter, and slender spreading somewhat pendulous branches which form a broad and often rather flat top. The bark of the trunk is from half to three quarters of an inch thick and is separated by deep fissures into long narrow longitudinal ridges, the surface of which is roughened by small persistent scales. The buds are minute, three or four together, and superposed, the two or three lower being without scales and covered by the embossed scar left by the falling of the petiole, while the upper one is larger, nearly surrounded by the petiole and covered with minute scurfy scales;[1] the spine-bud is minute, at some distance above the axil of the leaf, and embedded in the bark. The branchlets, which at first are light reddish brown, and slightly puberulous, are somewhat zigzag by the enlargement of the swollen nodes, and are thickened at the apex; they consist of a thin core of light yellow pith surrounded by a thick layer of pale straw-colored wood covered with lustrous reddish bark tinged with green and marked with minute lenticular spots; in their second year they are grayish brown. The spines, which are undeveloped branches, are three or four inches long, simple or three-forked,[2] terete, very sharp and rigid, long-pointed, thickened at the base, red at first and bright chestnut-brown when fully grown; they are produced on some individuals from above the axils of all the leaves, and sometimes in large numbers on the trunk and main branches, but are wanting or nearly wanting on others.[3] The leaves are from seven to eight inches in length, long-petiolate with petioles

[1] Macaire, *Bibl. de Gen.* xvii. 142. — Gray, *Structural Botany*, 50, f. 96.

[2] Baillon, *Bull. Soc. Bot. France*, v. 316.

[3] *G. triacanthos*, var. *inermis*, Willdenow, *Berl. Baumz.* 163. — Pursh, *Fl. Am. Sept.* i. 221. — De Candolle, *Mém. Légum.* t. 22, f. 109; *Prodr.* ii. 479. — Don, *Gen. Syst.* ii. 428. — Torrey & Gray, *Fl. N. Am.* i. 398. — Loudon, *Arb. Brit.* ii. 650, t. 92, 93. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 59. *G. inermis*, Moench, *Meth.* 69.

Individuals which have grown under conditions where they have been fully exposed to the light most frequently develop spines, while those which have grown in the forest in the shade of other trees are often unarmed — a rule, however, which does not always hold good.

abruptly enlarged at the base, and, like the rachises, flattened and grooved on the upper side; they are eighteen to twenty-eight-foliolate or sometimes bipinnate, with four to seven pairs of pinnæ, which increase in length towards the apex of the leaf, the upper pair being four or five inches long and the lowest often single leaflets; when they unfold they are covered with thick white tomentum; at maturity they are pubescent on the petioles and rachises, on the short stout petiolules, and on the under surface of the midribs of the leaflets. In autumn they turn a pale clear yellow. The leaflets are lanceolate-oblong, rather unequal at the base by the greater development of the upper side, acute or slightly rounded at the apex, remotely crenulate-serrate, dark green and lustrous on the upper surface, dull yellow-green on the lower surface, and from one to one and a half inches long and half an inch broad. The flowers are produced in June, when the leaves are nearly fully grown, from the axils of those of the year or of previous years, the staminate in short many-flowered pubescent racemes, which lengthen after the flowers begin to open, and which at maturity are from two to two and a half inches in length and often clustered, the pistillate in slender graceful few-flowered and usually solitary racemes two and a half to three and a half inches long. The flower-buds are nearly globose, and are covered with hoary orange-colored pubescence persistent on the outer surface of the calyx after the flowers have opened. The calyx is campanulate, narrowed at the base, its acute lobes, which have thick revolute ciliate margins and thickened tips and are covered on the two surfaces with white hairs, being rather shorter than the erect acute petals and half their width. The stamens are exserted, with slender filaments pilose towards the base and green anthers. The pistil is occasionally bicarpellary and is coated with thick white tomentum. The legumes, which are twelve to eighteen inches long or sometimes much shorter,[1] dark brown, pilose and slightly falcate with straight thickened margins, are borne two or three together in short racemes on stalks an inch or an inch and a half in length; their walls are thin and tough, with a thin papery inner coat, and contain a quantity of pulp between the seeds; they contract in drying with a number of cork-screw twists, and fall late in the autumn or in early winter.[2] The seeds are oval, flattened, and a third of an inch in length, with thin albumen and orange-colored embryos.

Gleditsia triacanthos grows naturally on the western slope of the Alleghany Mountains in Pennsylvania, and ranges westward through southern Ontario[3] and Michigan to eastern Nebraska and Kansas, and to about longitude 96° west in the Indian Territory, and southward to northern Alabama and Mississippi, and to the valley of the Brazos River in Texas. East of the Alleghany Mountains it has often become naturalized by seeds scattered from cultivated trees. It inhabits the borders of streams and intervale lands, growing in the most fertile soils with the Black Walnut, the Shellbark Hickory, the Red Elm, the Blue Ash, the Box Elder, and the Kentucky Coffee-tree, usually singly, but sometimes so multiplied as to form the prevailing tree-growth over considerable areas; or less commonly it is found on dry and sterile gravelly hills like those of central Kentucky to which the name of "barrens" has been given, and upon which it is the characteristic and often the prevailing tree. In the valleys of the smaller streams of southern Indiana and Illinois *Gleditsia triacanthos* attains its greatest size and majesty. Here individuals may still be found from one hundred and twenty to one hundred and forty feet in height, with trunks six feet in diameter and free of branches for sixty or seventy feet.[4] In less favorable situations and in poorer soil it is low, stunted, wide-branched, and often covered with thorns.

[1] *Gleditsia brachycarpa*, Pursh, *Fl. Am. Sept.* i. 221. — De Candolle, *Prodr.* ii. 479. — Sprengel, *Syst.* iii. 919. — Don, *Gen. Syst.* ii. 428. — Loudon, *Arb. Brit.* ii. 653. — Dietrich, *Syn.* v. 539.

G. triacanthos, var. *brachycarpos*, Michaux, *Fl. Bor.-Am.* ii. 257. — Torrey & Gray, *Fl. N. Am.* i. 399. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 50.

[2] The contraction of the walls of the pods of *Gleditsia triacanthos* seems to be intended to facilitate the distribution of the seeds. Without this provision they would remain where they fall under the trees, but the pods thus twisted roll like wheels, and, being very light, are blown for great distances over the frozen ground and especially over the snow. The obstacles they are obliged to overcome in their journeys probably help to break open the pods and liberate the seeds.

[3] J. W. Burgess, *Bot. Gazette*, vii. 95.

[4] Ridgway, *Proc. U. S. Nat. Mus.* 1882, 64.

The wood of *Gleditsia triacanthos* is hard, strong, and very durable in contact with the ground, although it is coarse-grained, with broad bands of large open ducts marking the layers of annual growth, and many conspicuous medullary rays. It is red or bright red-brown, with thin pale sapwood composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.6740, a cubic foot weighing 42.00 pounds. It is largely used for fence-posts and rails, and for the hubs of wheels, and somewhat in construction, for which purpose its weight and strength give it value.

Gleditsia triacanthos was first cultivated in Europe by Bishop Compton[1] in his garden at Fulham near London towards the end of the seventeenth century,[2] and the first account of it, drawn from the cultivated tree, was published by Plukenet[3] in 1700.

The Honey Locust[4] has been extensively planted both in the United States and in Europe since its first introduction.[5] It has many qualities to recommend it as an ornamental tree for the decoration of parks or the borders of highways. It is easily raised from seed and grows rapidly; it is not particular about soil; it is extremely hardy, and remarkably free from serious disease and the attacks of disfiguring insects. It can support the drought and dirt of cities better than most trees, and when well grown few trees compare with it in the beauty of its massive dark trunk and spreading head and in the grace and lightness of its lustrous foliage.[6] The lateness of the Honey Locust in covering itself with leaves, which do not appear until most trees are in full leaf, is the only serious drawback to it as an ornamental tree. Its hardiness, robust growth, and stout well-armed branches make it an excellent hedge plant, and it has been largely used for this purpose.

Few varieties of the Honey Locust have appeared in cultivation, and none of them possess special value with the exception of the form known in gardens as *Gleditsia Bujotii*,[7] distinguished by its graceful pendulous branches and small leaflets.

[1] See i. 6.

[2] Aiton, *Hort. Kew.* iii. 444.

[3] *Acacia Americana Abruæ foliis triacanthos, sive ad axillas foliorum spinâ triplici donata, Alm. Bot. Mant.* 1; *Amalth. Bot.* t. 352, f. 1. — Boerhaave, *Hort. Lugd. Bat.* ii. 56. — Miller, *Dict.* No. 1.

Acacia triacanthos, siliquis latis fuscis, pulpa virescente subdulci, Clayton, *Fl. Virgin.* 59.

Cæsalpinoides foliis pinnatis ac duplicato-pinnatis, Linnæus, *Hort. Cliff.* 489.

Gleditsia, Clayton, *Fl. Virgin.* 193. — Linnæus, *Hort. Ups.* 298. — Gouan, *Hort. Monsp.* 520.

[4] *Gleditsia triacanthos* is also called in some parts of the country Black Locust, Sweet Locust, and Honey Shucks.

[5] Duhamel, *Traité des Arbres*, i. 265, t. 105. — Evelyn, *Silva*, ed. Hunter, ii. 61. — Cobbett, *Woodlands*, No. 394. — Loudon, *Arb. Brit.* ii. 650, t. 91.

[6] The pistillate trees are more desirable than the staminate for ornamental plantings, as the fruit which hangs in great profusion from all the branches is conspicuous and beautiful from midsummer until it falls. The only sure way of obtaining them is by grafting seedling plants with grafts taken from trees known to bear female flowers.

[7] This handsome and distinct plant appeared previous to 1845 among a number of seedlings raised by a Monsieur Bujot, a nurseryman at Château-Thierry (*Rev. Hort.* 1845, 205).

EXPLANATION OF THE PLATES.

Plate CXXV. Gleditsia triacanthos.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. Diagram of a flower.
4. A staminate flower, enlarged.
5. Vertical section of a staminate flower, enlarged.
6. A pistillate flower, enlarged.
7. Vertical section of a pistillate flower, enlarged.
8. Vertical section of an ovary, enlarged.
9. An ovule, much magnified.

Plate CXXVI. Gleditsia triacanthos.

1. A cluster of fruit and a spine, natural size.
2. Vertical section of a portion of a legume, natural size.
3. A seed, natural size.
4. Vertical section of a seed, natural size.
5. Cross section of a seed, natural size.
6. An embryo, slightly enlarged.
7. A doubly pinnate leaf, natural size.
8. A winter branchlet, natural size.
9. Vertical section of a part of a branch showing the position of the buds.

EXPLANATION OF THE PLATES.

Plate CXXV. [illegible]

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate [illegible], natural size.
3. Diagram of a flower.
4. A staminate flower, enlarged.
5. Vertical section of [illegible] flower, enlarged.
6. [illegible]
7. Vertical [illegible] enlarged.
8. [illegible]
9. [illegible]

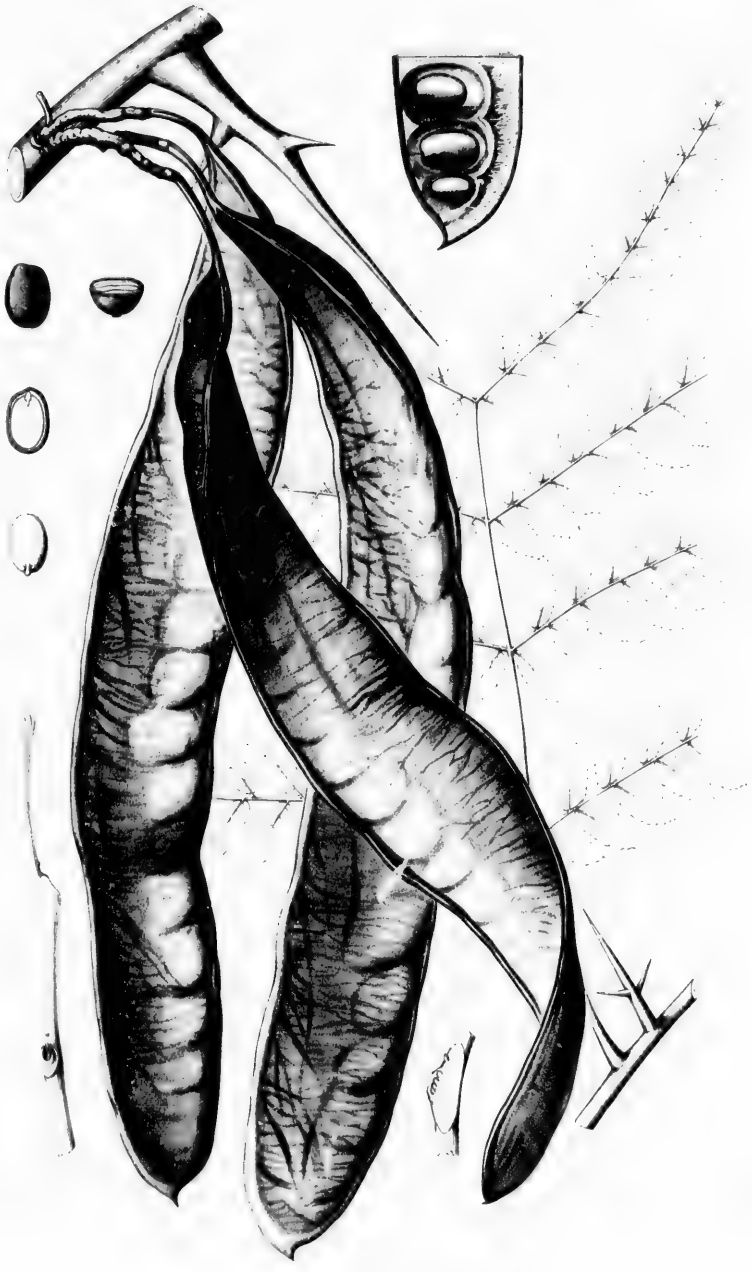
[illegible]

[illegible] natural size.

[illegible]

[illegible] the position of the [illegible].

ACACIA TRIACANTHOS



GLEDITSIA TRIACANTHOS

GLEDITSIA AQUATICA.

Water Locust.

LEGUME oval, oblique, usually one-seeded, without pulp, tardily dehiscent. Leaflets ovate-oblong.

Gleditsia aquatica, Marshall, *Arbust. Am.* 54. — E. L. Greene, *Bull. Torrey Bot. Club*, xiv. 225. — Watson & Coulter, *Gray's Man.* ed. 6, 149.

G. triacanthos, β. Linnæus, *Spec.* 1057.

G. inermis, Miller, *Dict.* ed. 8, No. 2 (not Linnæus). — Du Roi, *Harbk. Baum.* i. 296. — Koch, *Dendr.* i. 9. — E. L. Greene, *Bull. Torrey Bot. Club*, xv. 110. — Sargent, *Garden and Forest*, ii. 376.

G. monosperma, Walter, *Fl. Car.* 254. — Michaux, *Fl. Bor.-Am.* ii. 257. — Schkuhr, *Handb.* iv. 347. — Persoon, *Syn.* ii. 623 — Desfontaines, *Hist. Arb.* ii. 246. — Willdenow, *Spec.* iv. 1097; *Enum.* 1058; *Berl. Baumz.* 165. — *Nouveau Duhamel*, iv. 101. — Michaux f. *Hist. Arb. Am.* iii. 169, t. 11. — Pursh, *Fl. Am. Sept.* i. 221. — Nuttall, *Gen.* ii. 239. — Hayne, *Dendr. Fl.* 218. — Elliott, *Sk.* ii. 709. — De Candolle, *Prodr.* ii. 479. — Sprengel, *Syst.* iii. 919. — Don, *Gen. Syst.* ii. 428. — Spach, *Hist. Vég.* i. 98. — Torrey & Gray, *Fl. N. Am.* i. 398. — Dietrich, *Syn.* v. 539. — Chapman, *Fl.* 115. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 64. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 59. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxxi. 40 (*Mél. Biol.* xii. 455).

G. triacanthos, β. **aquatica**, Castiglioni, *Viag. negli Stati Uniti*, ii. 249.

G. Carolinensis, Lamarck, *Dict.* ii. 465; *Ill.* iii. 447, t. 857, f. 2. — Roemer & Schultes, *Syst.* vii. 74.

G. triacantha, Gærtner, *Fruct.* ii. 311, t. 146, f. 3.

Asacara aquatica, Rafinesque, *Sylva Tellur.* 121.

A tree, fifty to sixty feet in height, with a short trunk from two to two and a half feet in diameter, usually dividing, a few feet from the ground, into stout spreading and often contorted branches which form a wide irregular flat-topped head. The bark of the trunk is rarely more than an eighth of an inch thick, and is smooth, dull gray, or reddish brown, and divided by shallow fissures into small plate-like scales. The branchlets are glabrous and orange-brown, and in their second year are gray or reddish brown and marked by occasional large pale lenticels. The spines are usually compressed, simple or with one or two short lateral branches, straight or falcate, very sharp and rigid, three to five inches long, half an inch broad at the base, and dark red-brown and lustrous. The leaves are long-petiolate and from twelve to eighteen-foliolate, or are doubly pinnate with three or four pairs of pinnæ which increase in length towards the apex of the leaf. The petioles are slightly enlarged at the base, and, like the rachises, are slender, terete, and glabrous. The leaflets are ovate-oblong, usually rounded or rarely emarginate at the apex, unequally wedge-shaped at the base, slightly and remotely crenate, or often entire below the middle, dark green and lustrous on the upper surface, and dull yellow-green on the lower. They are glabrous with the exception of a few hairs on the short stout petiolules, and are an inch long and from a third to half an inch broad. The flowers are produced in May and June, after the leaves are fully grown, in slender racemes three or four inches long, with dark purple somewhat puberulous peduncles. The pedicels are short and stout, occasionally geminate, purple, and puberulous. The flower-buds are ovate or obovate, pointed at the apex, and covered with orange-brown pubescence which remains on the outer surface of the calyx-tube after the flowers have expanded. The calyx-lobes are narrow, acute, a little pilose on the two surfaces, and as long but narrower than the green erect petals which are rounded at their apex. The stamens are slightly exserted, with slender filaments hairy towards the base and large green anthers. The ovary is long-stipitate and glabrous. The legumes, which hang in graceful racemes, are pulpless, an inch to two inches long, an inch broad, obliquely ovate, long-stalked, and crowned with short stout tips. They are thin, with thin tough papery bright chestnut-brown lustrous valves somewhat thickened on the margins, and contain one, or rarely two, flat slightly obovate seeds half an inch in length with a thin orange-brown testa, thick albumen, and

compressed orange-colored embryos. The legumes, which are fully grown in August, and which are often produced in great quantities, fall in the autumn.

Gleditsia aquatica is found in the coast region of the southern Atlantic states from South Carolina to Matanzas Inlet in Florida, and in the Gulf states from the shores of Tampa Bay to the valley of the Brazos River in Texas; it spreads northward through western Louisiana and southern Arkansas to middle Kentucky and Tennessee, and to southern Illinois and Indiana. The Water Locust is rare east of the Mississippi River, where it grows in deep river-swamps with the Cypress, the Cotton Gum, the Scarlet Maple, and the Swamp Oak, but abounds on the rich bottom-lands west of the Mississippi, where it attains its greatest size and often occupies extensive tracts of low rich ground submerged during a considerable part of the year.

The wood of *Gleditsia aquatica* is heavy, and very hard and strong, although rather coarse-grained, with a fine surface which takes a high polish. It contains thin, conspicuous medullary rays, and bands composed of one to three rows of open ducts marking the layers of annual growth. It is rich bright brown tinged with red, the thick sapwood composed of about forty layers of annual growth, being a light clear yellow. The specific gravity of the absolutely dry wood is 0.7342, a cubic foot weighing 45.76 pounds.

The Water Locust was discovered in South Carolina by Mark Catesby, who introduced it into English gardens,[1] and who published the first description and figure of it in 1731 in his *Natural History of Carolina*.[2]

The Water Locust has not proved hardy in New England, and is now very rarely cultivated even in the more temperate parts of Europe.

[1] Loudon, *Arb. Brit.* ii. 653, f. 364.

[2] *Acacia Abruæ foliis, triacanthos, capsula ovali unicum semen claudente*, i. 43, t. 43. *Acacia Americana palustris abruæ foliis spinis rarioribus*, Miller, *Dict.* No. 2. *Cæsalpinoides foliis pinnatis ac duplicato-pinnatis, a.* Linnæus, *Hort. Cliff.* 489.

EXPLANATION OF THE PLATES.

Plate CXXVII. Gleditsia aquatica.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A stamen, enlarged.
6. A pistillate flower, enlarged.
7. Vertical section of a pistillate flower, enlarged.
8. Vertical section of an ovary, enlarged.

Plate CXXVIII. Gleditsia aquatica.

1. A fruiting branch, natural size.
2. A legume, natural size.
3. A legume, one of the valves removed, natural size.
4. Vertical section of a seed, natural size.
5. Cross section of a seed, natural size.
6. An embryo, natural size.
7. A portion of a branch with a doubly pinnate leaf, natural size.

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...compressed embryos. The legumes, which are fully grown in August, and which are ... in great quantities all in the autumn.

... to the coast region of the southern Atlantic states from South ... Florida, and in the Gulf states from the shores of Tampa Bay to the ... Texas; it spreads northward through western Louisiana and southern ... middle Kentucky and Tennessee, and to southern Illinois and Indiana. The Water ... east of the Mississippi River, where it grows in deep river-swamps with the Cypress, the ... Scarlet Maple, and the Swamp Oak, but abounds on the rich bottom-lands west of ... where it attains its greatest size and often occupies extensive tracts of low rich ground ... during a considerable part of the year.

The wood of *Gleditsia aquatica* is heavy, and very hard and strong, although rather coarse-... with a close surface which takes a high polish. It contains thin, conspicuous medullary rays. ... composed of one to three rows of ... marking the layers of annual growth. It is ... brown tinged with red, the thicker ... forty layers of annual growth, ... a bright clear yellow. The specific ... absolutely dry wood is 0.7342, a cubic foot ... 45.76 pounds.

The Water Locust was discovered ... Mark Catesby, who introduced it into ... gardens, and who published the first ... and figure of it in 1731 in his *Natural ...*

The Water Locust has ... and is now very rarely cultivated even ...

... *spinosa patiularis ... folis spinis ... ternatim ...*, Miller, ...

... *... folis pinnatis ac ... duplicato-pinnatis*, ... 486.

EXPLANATION OF THE PLATES.

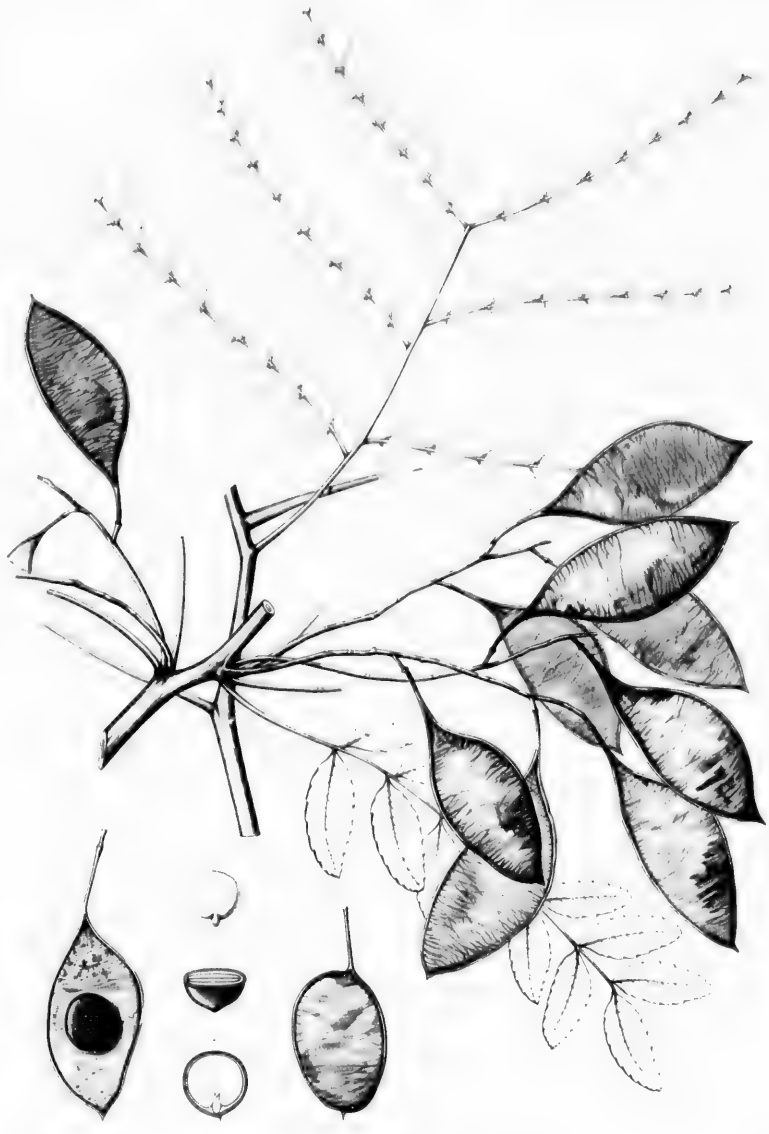
PLATE CXXVII. ... AQUATICA.

1. A ... bearing branch of the ... plant, natural size.
2. A ... bearing branch of the ... plant, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A stamen, enlarged.
6. A pistillate flower, enlarged.
7. Vertical section of a pistillate flower, enlarged.
8. Vertical section of an ovary, enlarged.

PLATE CXXVIII. GLEDITSIA AQUATICA.

1. A fruiting branch, natural size.
2. A legume, natural size.
3. A legume, one of the valves removed, natural size.
4. Vertical section of a ..., natural size.
5. Cross section of a ..., natural size.
6. A ..., natural size.
7. ... of a branch with a doubly pinnate leaf, natural size.

CURTISIA AQUATICA.



AESCHYNOMENE AQUATICA

CERCIDIUM.

Flowers perfect, in short axillary racemes; calyx disciferous, 5-lobed, the lobes valvate in æstivation; petals 5, nearly equal, imbricated in æstivation; ovary many-ovuled. Legume linear-oblong, compressed, 2-valved, conspicuously nerved on the ventral suture. Leaves abruptly bipinnate.

Cercidium, Tulasne, *Arch. Mus. Paris*, iv. 133. — Bentham & Hooker, *Gen.* i. 570. — Baillon, *Hist. Pl.* ii. 172. **Rhetinophlœum**, Karsten, *Fl. Columb.* ii. 25.

Trees or shrubs, with stout tortuous branches covered with bright green bark and armed with slender straight axillary spines. Leaves alternate, abruptly bipinnate, early deciduous, petiolate; pinnæ two or occasionally three, four to eight-foliolate; stipules inconspicuous or wanting; leaflets ovate or obovate, without stipels. Flowers in short graceful few-flowered axillary racemes solitary or fascicled. Bracts minute, membranaceous, early deciduous. Calyx contracted into a long stipe jointed on the slender pedicel, membranaceous, shortly campanulate, persistent, with equal acute deciduous lobes reflexed at maturity, their margins scarious, slightly revolute. Petals orbicular or oblong, unguiculate, bright yellow, the upper one broader and longer clawed than the others, a little auricled at the base of the blade, the claw (in the North American species) conspicuously glandular at the base. Stamens ten, inserted with the petals on the margin of the disk, free, slightly declinate, exserted; filaments filiform, pilose below, the upper one (in the North American species) enlarged at the base and gibbous on the upper side; anthers uniform, ovate, attached on the back below the middle, versatile, two-celled, the cells opening longitudinally. Ovary short-stalked, inserted at the base of the calyx-tube, glabrous or covered with long hairs; style slender, involute, infolded in the bud and terminated by a minute stigma; ovules suspended from the angle of the ovary opposite the posterior petal, superposed, anatropous, the micropyle superior. Legume linear-oblong, compressed or somewhat turgid, straight or slightly contracted between the seeds, thickened on the margins, that of the ventral suture acute or slightly grooved, tipped with the remnants of the style, tardily dehiscent, two-valved, the valves membranaceous or subcoriaceous, obliquely veined. Seeds suspended longitudinally on long slender funicles, ovate, compressed, the minute hilum near the apex; testa thin, crustaceous. Embryo compressed, surrounded by a thin layer of horny albumen; cotyledons oval, flat, rather fleshy; radicle very short, erect, near the hilum.

Cercidium is confined to the warmer parts of the New World, where it is distributed with four or five species[1] from the southern borders of the United States through Mexico, Central America, and Venezuela to Mendoza. Three species occur in the territory of the United States, two being small trees, and the third, a native of western Texas, a low intricately branched and often prostrate shrub.[2]

The North American species produce rather hard wood which is sometimes used as fuel, but the genus is not known to be otherwise useful to man.

The generic name, from *κερκίδιον*, refers to the fancied resemblance of the legume to a weaver's instrument of that name.

[1] Walpers, *Rep.* v. 552; *Ann.* iv. 594. — Karsten, *Fl. Columb.* iv. 25, t. 113 (Rhetinophlœum). — Hemsley, *Bot. Biol. Am. Cent.* i. 326.

[2] *Cercidium Texanum*, Gray, *Smithsonian Contrib.* iii. 58; v. 50 (*Pl. Wright.* i., ii.). — Walpers, *Ann. l. c.* — Torrey, *Bot. Mex. Bound. Surv.* 59. *Parkinsonia Texana*, Watson, *Proc. Am. Acad.* xi. 136. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 (*Man. Pl. W. Texas*).

The flowers of *Cercidium Texanum* are readily distinguished from those of the other North American species by the long white hairs which clothe the ovary.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Legume compressed, with straight margins; leaflets green, slightly glandular . . . . . 1. C. FLORIDUM.
Legume somewhat turgid, the margins often slightly contracted between the seeds; leaflets glaucous . . . . . 2. C. TORREYANUM.

CERCIDIUM FLORIDUM.

Green Barked Acacia.

LEGUME compressed, with straight acute margins. Leaflets green, slightly glandular.

Cercidium floridum, Bentham; Gray, *Smithsonian Contrib.* i. 58 (*Pl. Wright.* i.). — Walpers, *Ann.* iv. 594. — Hemsley, *Bot. Biol. Am. Cent.* i. 327. — Sargent, *Garden and Forest*, ii. 388.

Parkinsonia florida, Watson, *Proc. Am. Acad.* xi. 135. — Brewer & Watson, *Bot. Cal.* i. 162. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 (*Man. Pl. W. Texas*).

A tree, eighteen to twenty feet in height, with a short crooked trunk eight or ten inches in diameter and stout spreading branches covered with thin smooth bright green bark, and forming a low wide head. The bark of the trunk is a sixteenth of an inch thick, light brown tinged with green, with numerous short horizontal light gray ridge-like excrescences on its otherwise smooth surface. The branches are light or dark olive-green, slightly puberulous at first but soon glabrous; they are marked by a few black lenticular dots and are armed with slender spines an inch or less in length. The leaves appear in Texas in April, and farther south probably a month earlier, and remain on the branches until October; they are an inch or an inch and a half long, with two or rarely three pinnæ, broad pubescent petioles and rachises, and oval or somewhat obovate dark green puberulous and minutely glandular leaflets about a sixteenth of an inch in length, which are borne on short stout pubescent petiolules, rounded or slightly emarginate at the apex, and when they unfold are covered on the lower surface with scattered white hairs. The flowers, which are three quarters of an inch across when expanded, open in April with the leaves, and are produced in successive crops during three or four months, flowers and fully grown fruit appearing sometimes together on the same tree; they are borne in four or five-flowered racemes, with slender stems and branches furnished with small acuminate membranaceous caducous bracts. The flower-buds are oval or obovate, rounded at the apex, of a tawny orange color, and, like the young pedicels, faintly pilose. The legumes are compressed, oblong, straight, or slightly falcate, acute, with a narrow and acutely margined ventral suture; they are tardily dehiscent, with papery valves which are yellow tinged with brown on the outer surface and bright orange-colored within. They are from two to two and a half inches long, half an inch broad, two or three-seeded, and, like the ovary, quite glabrous. The seeds are a third of an inch long and compressed, with thin albumen covering the sides only of the bright green embryos.

Cercidium floridum is distributed from the shores of Matagorda Bay to Hidalgo County in western Texas[1] and to northern Mexico, where it abounds on dry gravelly mesas from the mouth of the Rio Grande to the foothills of the Sierra Madre, and in many of the low valleys in the neighborhood of Monterey. It is not common in Texas, where it appears to have been first noticed in 1881 by Mr. S. B. Buckley, but in Mexico it forms a conspicuous feature in the region which it inhabits, enlivening it with its bright green branches, and in spring and early summer with its abundant brilliant golden flowers.

The wood of *Cercidium floridum* is light, soft, and close-grained, with a smooth satiny surface, and contains numerous thin prominent medullary rays, and bands of from one to three rows of open cells which mark the layers of annual growth. It is pale yellow tinged with green, the thick sapwood

[1] Where it was collected by G. C. Nealley in 1889. (See Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 [*Man. Pl. W. Texas*], under *Parkinsonia Torreyana*.)

being lighter colored than the heartwood. The specific gravity of the absolutely dry wood is 0.5483, a cubic foot weighing 34.17 pounds.[1]

Cercidium floridum was probably discovered in Mexico by Dr. Thomas Coulter.[2]

[1] *Garden and Forest*, iii. 332.

[2] Of the birth and early history of Thomas Coulter, who died in Dublin in 1843, nothing now appears to be known. He is said to have come to America as the surgeon of an English mining company; later, to gratify his taste for botanical exploration, he went to Monterey, California, which he reached in 1831, remaining there at least two years. He made a number of botanical journeys in California, and was the first botanist to explore the flora of the desert of the lower Colorado and Gila basins, which he visited in 1832. Returning to Europe, Dr. Coulter was appointed curator of the herbarium in the Botanic Garden at Dublin, a position which he filled during the remainder of his life. His name is associated in the minds of the lovers of trees with a noble California Pine discovered by him and remarkable for the great size of its cones.

EXPLANATION OF THE PLATE.

PLATE CXXIX. CERCIDIUM FLORIDUM.

1. A flowering branch, natural size.
2. The petals of a flower displayed, natural size.
3. A stamen, enlarged.
4. Vertical section of a pistil, enlarged.
5. A fruiting branch, natural size.
6. A legume, one of the valves removed, natural size.
7. A seed cut transversely, enlarged.
8. An embryo, enlarged.

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EXPLANATION OF THE PLATE.

PLATE CXXIX.

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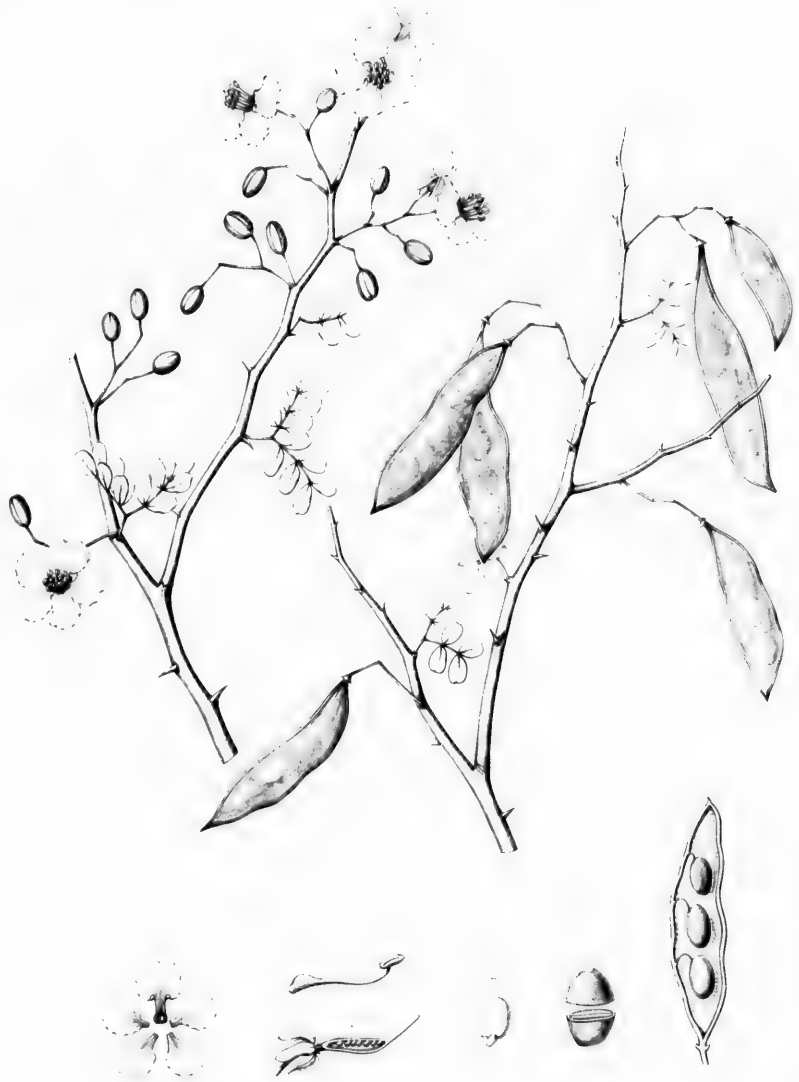

CERCIDIUM FLORIDUM

CERCIDIUM TORREYANUM.

Green Barked Acacia. Palo Verde.

LEGUME somewhat turgid, often slightly contracted between the seeds, the nerve of the ventral suture often slightly grooved. Leaflets glaucous.

Cercidium Torreyanum, Sargent, *Garden and Forest*, ii. 388.

Cercidium floridum, Torrey, *Pacific R. R. Rep.* iv. 82; v. 360, t. 3; *Bot. Mex. Bound. Surv.* 59 (not Bentham). — Gray, *Ives' Rep.* 11.

Parkinsonia Torreyana, Watson, *Proc. Am. Acad.* xi. 135. — Brewer & Watson, *Bot. Cal.* i. 162. — Hemsley, *Bot. Biol. Am. Cent.* i. 327.

A low, intricately branched tree, leafless for most of the year, twenty-five to thirty feet in height, with a short often inclining trunk eighteen or twenty inches in diameter, and stout branches covered with yellow or olive-green bark, forming a narrow upright irregular head. The bark of the trunk on old trees is reddish brown, an eighth of an inch thick, and furrowed near the base, the surface separating into thick plate-like scales; on young individuals it is thinner, smooth, and pale olive-green. The branchlets are slightly zigzag, quite glabrous even when they first appear, light yellow or pale olive-green and glaucous, and are armed with thin straight or curved spines a quarter of an inch long. The leaves are an inch in length, covered when they unfold with pale tomentum, and puberulous at maturity, with slender petioles and two pinnæ, each composed of two or three pairs of oblong obtuse glaucous leaflets narrowed towards the somewhat oblique base, and from a twelfth to a sixth of an inch long. The leaves, which are few and scattered, unfold in March and April, and fall almost as soon as they are fully grown, a small second crop sometimes appearing in September after the autumn rains. The flowers, which open in April, are hardly distinguishable from those of *Cercidium floridum*. The legumes are three or four inches long, two to eight-seeded, slightly turgid, and often contracted between the seeds, the nerve of the ventral suture being often grooved; they ripen and fall from the trees during the month of July. The seeds are thicker, but otherwise resemble those of *Cercidium floridum*.

Cercidium Torreyanum grows on the Colorado Desert of southern California and in the valley of the lower Gila River in Arizona, extending southward into Sonora and Lower California.[1] It is scattered on the sides of low cañons and in depressions among the sand-hills of the desert, which it brightens with the cheerful coloring of its trunk and branches, exciting the delight and wonder of all travelers in that dreary and forbidding region.

The wood of *Cercidium Torreyanum* is heavy although not strong, soft and close-grained, with a satiny surface susceptible of receiving a good polish. It contains numerous thin medullary rays, and small evenly distributed open ducts. It is light brown with clear light yellow sapwood. The specific gravity of the absolutely dry wood is 0.6531, a cubic foot weighing 40.70 pounds.

The Green-barked Acacia was probably discovered in southern California by Frémont during his second transcontinental journey.

[1] Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 69, 88.

EXPLANATION OF THE PLATE.

PLATE CXXX. CERCIDIUM TORREYANUM.

1. A flowering branch, natural size.
2. A young leafy shoot, natural size.
3. Diagram of a flower.
4. The petals of a flower displayed, enlarged.
5. A flower, the calyx and corolla removed, enlarged.
6. A pistil, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. A legume, one of the valves removed, natural size.
10. Vertical section of a seed, natural size.
11. Cross section of a seed, natural size.
12. An embryo, enlarged.

CERCIDIUM TORREYANUM

PARKINSONIA.

Flowers perfect, in axillary racemes; calyx disciferous, 5-lobed, the lobes slightly imbricated or subvalvate in æstivation; petals 5, nearly equal, narrowly imbricated or valvate in æstivation; ovary many-ovuled. Leaves abruptly bipinnate.

Parkinsonia, Linnæus, *Gen.* 342. — Adanson, *Fam. Pl.* ii. 318. — A. L. de Jussieu, *Gen.* 347. — Meisner, *Gen.* 98. — Endlicher, *Gen.* 1314. — Bentham & Hooker, *Gen.* i. 570. — Baillon, *Hist. Pl.* ii. 171.

Trees or shrubs, with smooth thin bark and terete branches often armed with simple or three-forked spines. Leaves alternate or fascicled from earlier axils, short-petiolate, the rachis short and spinescent with two to four secondary elongated rachises bearing numerous minute opposite entire leaflets without stipels; stipules short, spinescent, persistent, or caducous. Flowers on thin elongated jointed pedicels developed from the axils of minute caducous bracts, in slender axillary solitary or fascicled racemes. Calyx shortly campanulate, the narrow membranaceous lobes nearly equal, reflexed at maturity, deciduous. Petals bright yellow, unguiculate, much longer than the lobes of the calyx, spreading, the upper one rather broader than the others and glandular at the base of the claw. Stamens ten, inserted in two rows on the margin of the disk, free, slightly declinate, included or exserted, those of the outer row opposite the sepals and rather longer than the others; filaments villose below the middle, the upper one enlarged at the base and gibbous on the upper side; anthers uniform, attached on the back below the middle, versatile, two-celled, the cells opening longitudinally. Ovary inserted at the base of the calyx-tube, shortly stipitate, pilose, many-ovuled, contracted into a slender filiform incurved style infolded in the bud and tipped with a minute stigma; ovules suspended from the inner angle of the ovary, two-ranked, anatropous, the micropyle superior. Legume linear, torulose, acuminate at the two ends, two-valved, the valves thin and coriaceous, convex by the growth of the seeds, contracted between and beyond them, and longitudinally striate, the endocarp readily separable from the exocarp at maturity. Seed oblong, suspended longitudinally by a slender funicle, the hilum minute, near the apex; testa thin, crustaceous, light brown. Embryo inclosed on the sides only by thick layers of horny albumen; cotyledons oval, flat, slightly fleshy, the radicle very short and straight.

The genus Parkinsonia, which contains three species, is confined to the warmer parts of America and to southern Africa, where a single species[1] occurs. The American species are small trees found within the territory of the United States, one in the mountains of Arizona, and the other, *Parkinsonia aculeata*, the type of the genus, along our southern border, where it sometimes has the appearance of having grown without the agency of man.[2]

The American species furnish hard close-grained wood. *Parkinsonia aculeata* has long been used in many tropical countries to form hedges, its stout well-armed branches, rapid growth, and indifference to heat and drought making it valuable for this purpose. In some parts of India the branches are cut as food for goats,[3] and it is said to have supplied the natives of Mexico with a febrifuge and

[1] *Parkinsonia Africana*, Sonder, *Linnæa*, xxiii. 38. — Harvey & Sonder, *Fl. Cap.* ii. 269.

[2] *Parkinsonia aculeata* has become widely naturalized through the warmer and tropical parts of the world, and its native country is uncertain (A. de Candolle, *Géographie Botanique*, ii. 770). According to Browne (*Nat. Hist. Jam.* 222) it was introduced into Jamaica from the mainland, and students of botanical geography believe that it has only appeared in Asia and Africa in comparatively recent years. If it is American, it is probably indigenous in the basin of the Rio Grande and on the Mexican plateau, or in some high country of western South America, as it is scarcely possible that if it had originated in the warm climate of southern Mexico or of Central America it would have been able to establish itself and spread as widely as it has in a region of such severe cold and serious climatic changes as western Texas.

[3] Brandis, *Forest Fl. Brit. Ind.* 158.

sudorific, a remedy against epilepsy,[1] and a means for producing abortion.[2] The young branches of *Parkinsonia microphylla* are greedily eaten by domestic animals, and are gathered in considerable quantities for fodder[3] by the inhabitants of the islands of the Gulf of California.

The genus, established by Plumier[4] and adopted by Linnæus, was dedicated to John Parkinson.[5]

[1] Torrey, *Bot. Mex. Bound. Surv.* 59.
[2] Havard, *Proc. U. S. Nat. Mus.* viii. 501.
[3] Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 82.
[4] *Nov. Pl. Am. Gen.* 25, t. 3.
[5] See *ante*, 16.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Flowers in long slender racemes; petals imbricated in æstivation; legumes one to eight-seeded; leaves long, the rachises of the pinnæ flat, wing-margined, many-foliolate; branches armed with the enlarged spinescent rachises of the primary leaves	1. P. ACULEATA.
Flowers in short racemes; petals valvate in æstivation; legumes one to three-seeded; leaves short, rachises of their pinnæ terete, eight to twelve-foliolate; branches unarmed	2. P. MICROPHYLLA.

PARKINSONIA ACULEATA.

Retama. Horse Bean.

FLOWERS in long slender racemes. Legumes 1 to 8-seeded. Leaves long, the rachises of the pinnæ flat, wing-margined, many-foliolate. Branches armed.

Parkinsonia aculeata, Linnæus, *Spec.* 375. — Miller, *Dict.* ed. 8, No. 1. — Lamarck, *Ill.* ii. 475, t. 336. — Persoon, *Syn.* i. 459. — Willdenow, *Spec.* ii. 513. — De Candolle, *Mém. Légum.* 119, t. 22, f. 112; *Prodr.* ii. 486. — Sprengel, *Syst.* ii. 345. — Don, *Gen. Syst.* ii. 434. — Spach, *Hist. Vég.* i. 108. — Dietrich, *Syn.* ii. 1496. — Bentham, *Bot. Voy. Sulphur*, 87. — Torrey, *Bot. Mex. Bound. Surv.* 59. — Brewer & Watson, *Bot. Cal.* i. 162. — Hemsley, *Bot. Biol. Am. Cent.* i. 327. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 60. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 (*Man. Pl. W. Texas*).

A low tree, eighteen to thirty feet in height, with a trunk sometimes a foot in diameter, usually separating at six or eight feet from the ground into slender spreading slightly pendulous branches which form a wide graceful head. The bark of the trunk is brown tinged with red, and an eighth of an inch thick, the generally smooth surface being broken into small persistent plate-like scales. The branchlets, which are slightly zigzag, are covered with yellow-green puberulous bark during their first season, and are glabrous, gray, or light orange-colored, and often roughened with lenticels in their second and third years. The leaves are short-petiolate, persistent, light green, and glabrous except for a few hairs on the lower part of the young secondary rachises. The spinescent rachises of the leaves produced on the young branchlets bear two or four pinnæ, and develop into stout rigid persistent sharp-pointed chestnut-brown spines an inch or occasionally an inch and a half in length and marked near the base by the prominent scars left by the falling of the pinnæ. The stipules of the primary leaves are persistent, and appear on the spines as stout lateral spiny branches. In the axils of these enlarged rachises fascicles of leaves are produced, each with a short terete spinescent rachis bearing two pinnæ and furnished with minute caducous spinescent stipules. The rachises of the pinnæ of the primary and secondary leaves are flat, a sixteenth of an inch long, conspicuously wing-margined and acute at the apex, and bear from twenty-five to thirty pairs of leaflets which vary from a sixteenth to an eighth of an inch in length and are oval or obovate, minutely apiculate, and long or short-petiolulate. The flower-buds are oval or obovate, dark orange-brown, a quarter of an inch long and shorter than the slender pedicels. The flowers are fragrant, an inch across when expanded, and produced in slender erect racemes which are five or six inches long and continue to appear on the growing branches during the spring and summer months, or in the tropics throughout the year. The petals are bright yellow, the upper one being marked near the base on the inner surface with conspicuous red spots, and are much longer than the stamens. The legumes hang in graceful racemes; they are from two to four inches in length, long-pointed, dark orange-brown, faintly pilose, and compressed between the remote seeds. These are a third of an inch long and nearly circular in section, with thick albumen and bright yellow embryos.

Parkinsonia aculeata is generally distributed in Texas along the valley of the lower Rio Grande, where it selects open situations and low wet soil on the borders and around the ends of lagoons; it is common in northern Mexico, in the valley of the Colorado River in Arizona and California, and in Lower California.

It is now well established on Key West, and is widely naturalized in the Bahama and other West

India Islands,[1] in many of the countries of Central and South America,[2] and in tropical Africa[3] and Asia.[4]

The wood of *Parkinsonia aculeata* is heavy, hard, and very close-grained, and contains numerous thin conspicuous medullary rays and small evenly distributed open ducts; it is light brown with very thick lighter colored sapwood tinged with yellow. The specific gravity of the absolutely dry wood is 0.6116, a cubic foot weighing 38.11 pounds.

Parkinsonia aculeata was first described by Plumier in the *Nova Plantarum Americanarum Genera*,[5] published in 1703; it was cultivated in the Physic Garden at Chelsea in England by Philip Miller in 1739,[6] and has quickly spread through many warm countries, where it is valued for its hardiness and rapid growth, for the strange appearance of its long fine narrow leaves and the beauty of its perennial flowers, and for its usefulness as a hedge plant. The Retama, which is the name given to *Parkinsonia aculeata* by the inhabitants of the regions bordering the Rio Grande, is often found in the gardens of southern Europe[7] and in those of western Texas; and it may now be seen growing spontaneously in the neighborhood of many of the towns of Texas, northern Mexico, and southern California.

[1] Jacquin, *Stirp. Am.* 121, t. 80; *Pl. Rar. Amer.* 61, t. 119. — *Icon. Am. Gewach.* ii. 31, t. 135. — Lunan, *Hort. Jam.* i. 398. — Descourtilz, *Fl. Med. Antil.* i. 54, t. 12. — Macfadyen, *Fl. Jam.* 334. — Richard, *Fl. Cub.* ii. 221. — Grisebach, *Fl. Brit. W. Ind.* 204; *Pl. Lorenz.* 81. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 46.

[2] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 78, t. 26.

[3] Oliver, *Fl. Trop. Afr.* ii. 267.

[4] Roxburgh, *Hort. Beng.* 31. — Wight & Arnott, *Prodr. Fl. Ind.* 284. — Miquel, *Fl. Ind. Bat.* i. pt. i. 115. — Beddome, *Fl. Sylv. S. Ind.* ii. xci. t. 13, f. 2. — Hooker f. *Fl. Brit. Ind.* ii. 260. — Gamble, *Man. Indian Timbers*, 134.

[5] *Parkinsonia aculeata, foliis minutis, uni costæ adnexis*, 25, t. 3.

Parkinsonia aculeata, foliis Mimosæ uni costæ adfixis, Gleditsch, *Hort. Walth.* 36, t. 13.

Parkinsonia, Linnæus, *Hort. Cliff.* 157, t. 13; *Hort. Ups.* 99. — Royen, *Fl. Leyd. Prodr.* 465.

Parkinsonia aculeata, foliolis minutissimis pinnatis, pennâ longiori compressa; the *Jerusalem* Thorn, Browne, *Nat. Hist. Jam.* 222.

[6] Aiton, *Hort. Kew.* ii. 49.

[7] Naudin, *Manuel de l'Acclimateur*, 392.

EXPLANATION OF THE PLATE.

PLATE CXXXI. PARKINSONIA ACULEATA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. Vertical section of a flower, the corolla removed, enlarged.
5. An ovule, much magnified.
6. A cluster of fruit, natural size.
7. A portion of a legume, one of the valves removed, natural size.
8. Cross section of a seed, natural size.
9. Vertical section of a seed, enlarged.
10. An embryo, enlarged.

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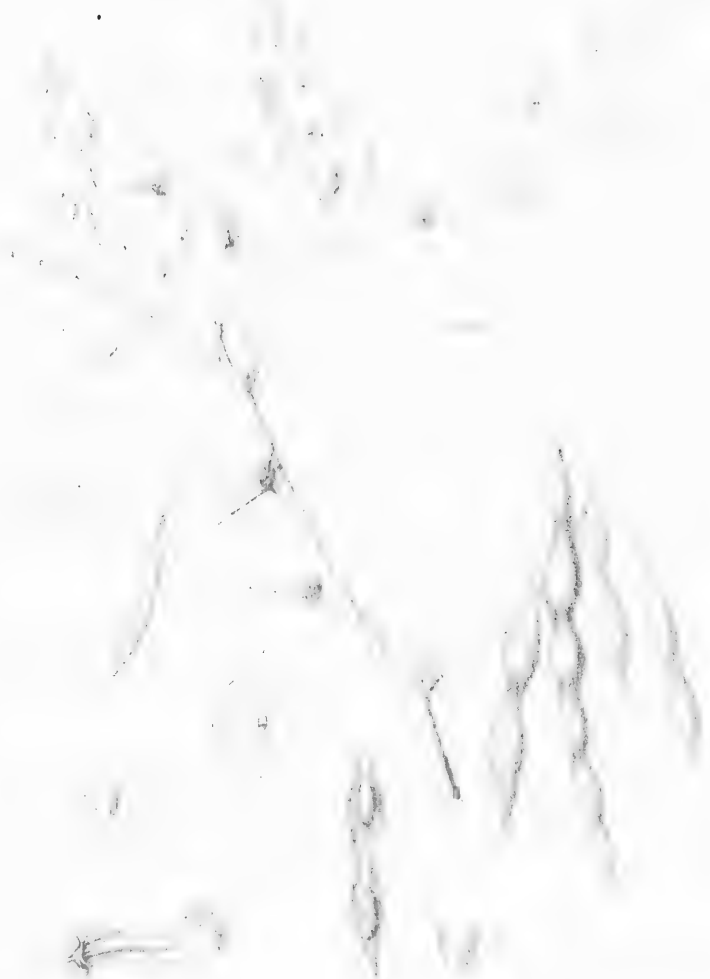
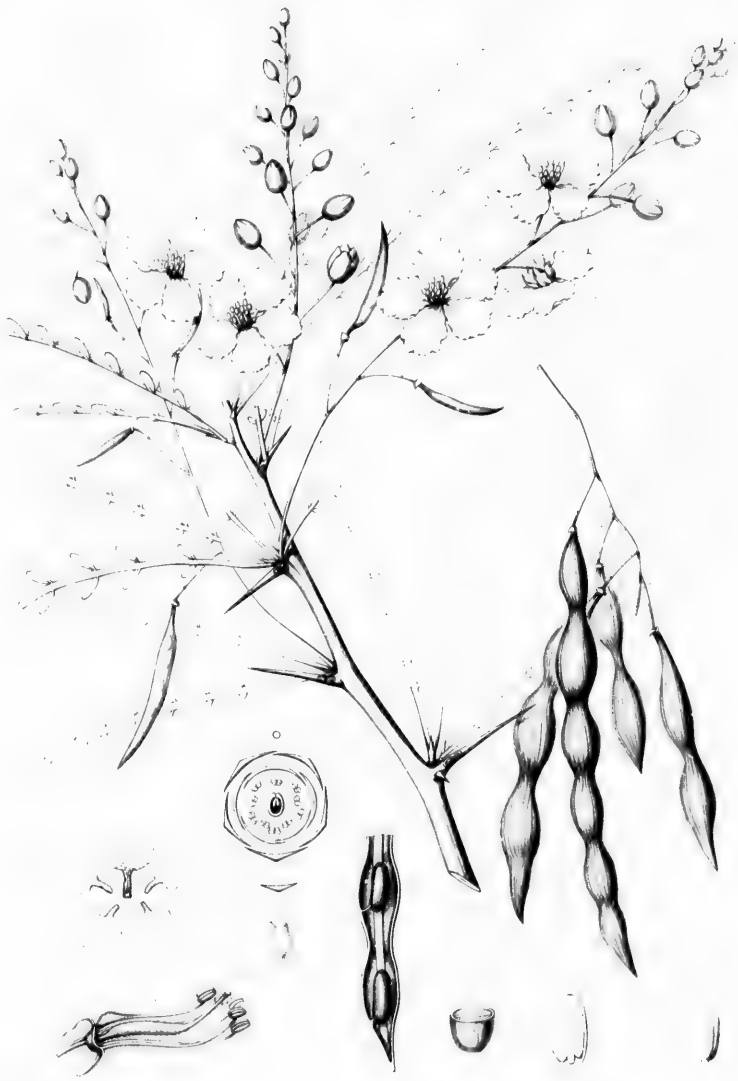




CASSIA ACUTIFOLIA

PARKINSONIA MICROPHYLLA.

FLOWERS in short racemes. Legumes 1 to 3-seeded. Leaves short, the rachises of the pinnæ terete, 8 to 12-foliolate. Branches unarmed.

Parkinsonia microphylla, Torrey, *Pacific R. R. Rep.* iv. 82; *Bot. Mex. Bound. Surv.* 59. — Walpers, *Ann.* vii. 812. — Gray, *Ives' Rep.* 11. — Bentham, *Martius Fl. Brasil.* xv. pt. ii. 78. — Watson, *Proc. Am. Acad.* xi. 136. — Brewer & Watson, *Bot. Cal.* i. 162. — Hemsley, *Bot. Biol. Am. Cent.* i. 327. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 60.

A low intricately branched tree, occasionally twenty or twenty-five feet in height, with a trunk a foot in diameter, and straight rigid branchlets terminating in stout spines; or more often a shrub with many stems from three to ten feet high. The bark on old trees is a quarter of an inch thick, dark orange-colored, and generally smooth, although sometimes roughened by scattered clusters of short light gray horizontal ridges. The branchlets are stout, pale yellow-green, covered at first with deciduous tomentum, slightly puberulous during their first and second seasons, and often marked by the persistent scales of undeveloped buds. The leaves are an inch long, pale, densely tomentose when they unfold, pubescent at maturity, and deciduous at the end of a few weeks after their appearance; the rachis is short, rarely spinescent, or more commonly wanting; the rachises of the pinnæ are slightly grooved on the upper side and are jointed at the points of attachment of the leaflets which are distant, entire, sessile, broadly oblong or nearly orbicular, obtuse or somewhat acute at the apex, oblique at the base, and a sixth of an inch long. The flowers, which are a third of an inch across when expanded, are borne on slender pedicels in racemes an inch or less in length developed from the axils of leaves of the previous year; they are pale yellow, with exserted stamens, and open in May or early June before the new growth and the leaves appear. The legumes, which probably hang on the branches for at least a year, are frequently one, and rarely three-seeded; they are two or three inches long, slightly puberulous, especially towards the base, and are contracted at the two ends, the long acuminate apex being often falcate. The seed is a third of an inch in length, with a pale brown testa and a bright green embryo.

Parkinsonia microphylla inhabits the deserts of southern Arizona and the adjacent regions of California, Sonora, and Lower California.

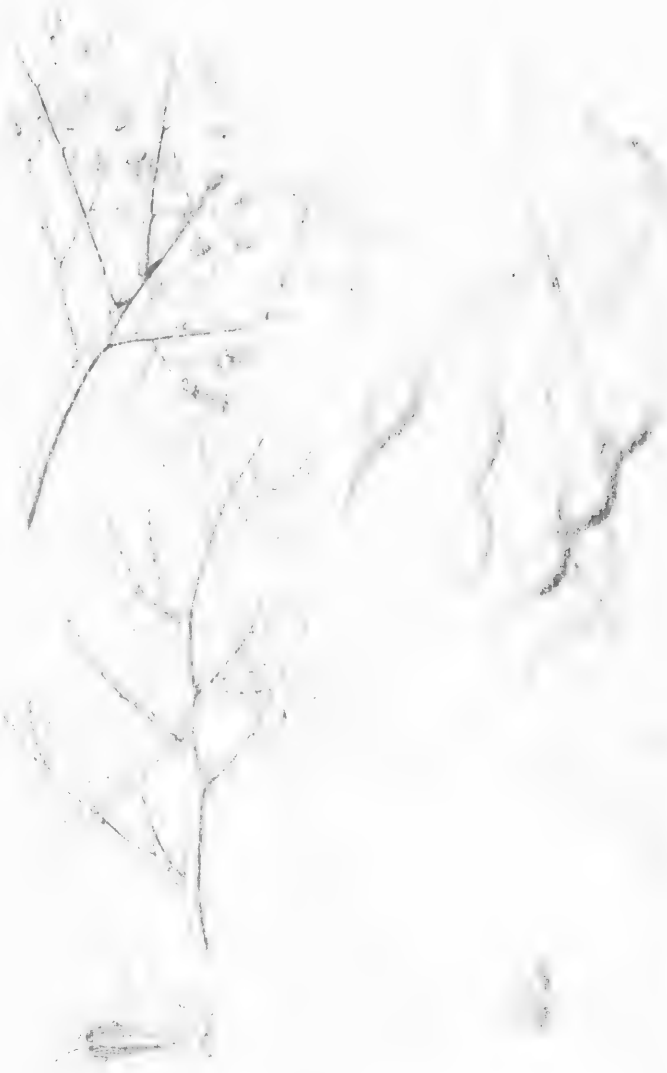
The wood is heavy, hard, and close-grained, with numerous thin conspicuous medullary rays and many large scattered open ducts. It is dark orange-brown streaked with red, with thick light brown or yellow sapwood composed of twenty-five or thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.7449, a cubic foot weighing 46.42 pounds.

Parkinsonia microphylla is nowhere common, and it is only known to attain the size and habit of a tree in the neighborhood of Wickenburg in Arizona. It appears to have been first discovered, probably in the valley of the Colorado River, by Dr. Thomas Coulter in 1832, although it was not described until many years later, when it was rediscovered by the members of the Mexican Boundary Survey Commission.

EXPLANATION OF THE PLATE.

PLATE CXXXII. PARKINSONIA MICROPHYLLA.

1. A flowering branch, natural size.
2. A leafy branch, natural size.
3. Vertical section of a flower, enlarged.
4. The petals of a flower displayed, enlarged.
5. A fruiting branch, natural size.
6. A legume, one of the valves removed, natural size.
7. A seed cut transversely, enlarged.
8. An embryo, slightly enlarged.



EXPLANATION [illegible] PLATE.

[illegible] XXII. [illegible] MICROSTYLIS

[illegible] drawing [illegible] natural size

[illegible] [illegible] [illegible] enlarged

[illegible] [illegible] [illegible] enlarged

[illegible] [illegible] [illegible]

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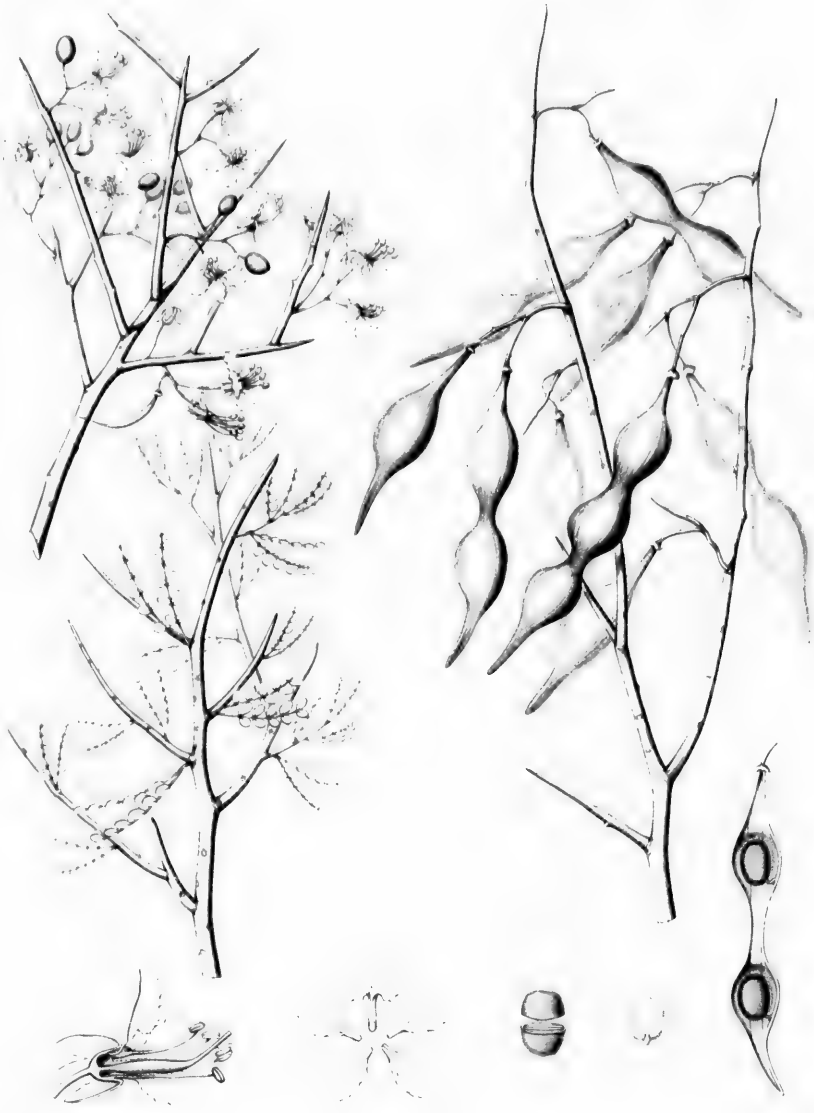

CERCIS.

Flowers fascicled or racemose; calyx disciferous, shortly turbinate, 5-toothed, the short broad teeth imbricated in æstivation; corolla subpapilionaceous, the upper petal the smallest, inserted within the others; ovary many-ovuled. Legume compressed, narrow-winged on the ventral suture. Leaves simple.

Cercis, Linnæus, *Gen.* 125. — A. L. de Jussieu, *Gen.* 351. — Meisner, *Gen.* 99. — Endlicher, *Gen.* 1310. — Bentham & Hooker, *Gen.* i. 576. — Baillon, *Hist. Pl.* ii. 187.

Siliquastrum, Adanson, *Fam. Pl.* ii. 317.

Small trees or shrubs, with scaly bark, slender unarmed branches, and small scaly buds. Leaves simple, alternate, entire or emarginate at the apex, three or many-nerved, long-petiolate, deciduous; stipules small, membranaceous, deciduous. Flowers on thin jointed pedicels in simple fascicles or in short or long racemes produced on the branches of the previous or of earlier years, or on the trunk.[1] Bracts small, scale-like, often imbricated at the base of the inflorescence; bractlets minute or wanting. Calyx colored, persistent, the tube oblique at the base, campanulate, enlarged on the lower side, the five teeth short and broadly triangular. Petals nearly equal, pink or rose-color, oblong-ovate, rounded at the apex, unguiculate, slightly auricled on one side of the base of the blade, the upper one the smallest and inclosed in the bud by the wings encircled by the broader slightly imbricated keel-petals, the vexillum and wings reflexed after anthesis. Stamens ten, inserted in two rows on the margin of the thin disk, free, declinate, those of the inner row opposite the petals and rather shorter than the others; filaments enlarged and pilose below the middle, persistent until the fruit is grown; anthers uniform, oblong, attached on the back near their base, two-celled, the contiguous cells opening longitudinally. Ovary shortly stipitate, inserted obliquely in the bottom of the calyx-tube, many-ovuled; style filiform, fleshy, incurved, tipped with a stout obtuse stigma; ovules two-ranked, superposed, attached to the inner angle of the ovary, anatropous, the micropyle superior. Legume slightly stipitate, oblong or broadly linear, acute at the two ends, compressed, tipped with the thickened remnants of the style, many-seeded, two-valved, the valves coriaceo-membranaceous, reticulate-veined, tardily dehiscent by the dorsal and often by the wing-margined ventral suture, dark red-purple and rather lustrous at maturity, the thin endocarp silvery white. Seed suspended transversely by a slender funicle, ovate or oblong, compressed, the hilum near the apex, small, depressed; testa crustaceous, reddish brown, the tegmen thickened. Embryo surrounded by a thin layer of horny albumen, compressed; cotyledons oval, flat, the radicle short, straight or obliquely incurved, slightly exserted.

Cercis is found in North America, where it occurs on the two sides of the continent, in Europe, in the Orient, and in central and eastern Asia. The type is an ancient one, and the genus has existed in Europe almost in its present state from the Eocene period.[2] Seven species are now distinguished. The type of the genus, *Cercis Siliquastrum*,[3] is widely distributed in southern Europe and in the Orient.[4] *Cercis Griffithii*[5] inhabits Afghanistan, *Cercis Chinensis*[6] and *Cercis racemosa*[7] the prov-

[1] The flowers developed upon the trunk or the old branches are, according to Baillon (*Hist. Pl.* ii. 122), produced year after year from excrescences which correspond to the axils of ancient leaves, and are composed of the remnants of the axes of earlier inflorescences which have gradually united and formed a more or less prominent mass.

[2] Saporta, *Origine Paléontologique des Arbres*, 315, f. 43, 2, 3.

[3] Linnæus, *Spec.* 374. — Sibthorp, *Fl. Græc.* iv. 60, t. 367. — De Candolle, *Prodr.* ii. 518. — *Bot. Mag.* t. 1138. — Loudon, *Arb. Brit.* ii. 657. — Koch, *Dendr.* i. 13.

[4] Boissier, *Fl. Orient.* ii. 633.

[5] Boissier, *l. c.*

[6] Bunge, *Mém. Sav. Etr. St. Pétersbourg*, ii. 95 (*Enum. Pl. Chin. Bor.* 21). — Miquel, *Prol. Fl. Jap.* 243. — Franchet & Savatier, *Enum. Pl. Jap.* i. 116. — Hemsley, *Jour. Linn. Soc.* xxiii. 213.

[7] Oliver, *Hooker Icon.* xix. t. 1894. — Hemsley, *l. c.*

inces of central and northern China; *Cercis Chinensis* is also found in Japan, where it is thought to have been introduced. Of the North American species two are small trees, and the third, *C. occidentalis*,[1] an inhabitant of the western foothills of the California Sierras, is a tall many-branched shrub.[2]

Cercis, bestowed on the European species by Linnæus, who discarded the *Siliquastrum* of Tournefort,[3] is formed from κερκίς, the Greek name of the tree, and derived from a fancied resemblance in the fruit to a weaver's implement of that name.

[1] Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 177 (*Pl. Lindheim.* ii.). — Torrey, *Bot. Wilkes Explor. Exped.* 283, t. 3. — Brewer & Watson, *Bot. Cal.* i. 160.

C. Siliquastrum, var., Bentham, *Pl. Hartweg.* 307, 361.

[2] A few common insects, like the Web-worms, occasionally attack Cercis in the United States, although only one is recorded as peculiar to the genus in this country. This is the larva of a little moth *Gelechia cerceriella*, Chambers, said to be very common in it, sometimes folding the leaves together (*Canadian Entomologist*, iv. 108).

[3] *Inst.* 646, t. 414.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Flowers in sessile clusters; leaves ovate, acute, cordate, or truncate at the base . . . . . 1. C. Canadensis.
Flowers fascicled or slightly racemose; leaves reniform . . . . . 2. C. Texensis.

CERCIS CANADENSIS.

Redbud. Judas Tree.

FLOWERS in sessile clusters. Leaves ovate, acute, cordate, or truncate at the base.

Cercis Canadensis, Linnæus, *Spec.* 374. — Miller, *Dict.* ed. 8, No. 2. — Du Roi, *Harbk. Baum.* i. 147. — Marshall, *Arbust. Am.* 32. — Castiglioni, *Viag. negli Stati Uniti*, ii. 223. — Lamarck, *Dict.* ii. 586. — Wangenheim, *Nordam. Holz.* 84. — Walter, *Fl. Car.* 135. — Willdenow, *Spec.* ii. 508; *Enum.* 439; *Berl. Baumz.* 84. — *Nouveau Duhamel*, i. 19. — Michaux, *Fl. Bor.-Am.* i. 265. — Schkuhr, *Handb.* i. 354. — Persoon, *Syn.* i. 454. — Desfontaines, *Hist. Arb.* ii. 254. — Pursh, *Fl. Am. Sept.* i. 308. — Nuttall, *Gen.* i. 283. — Hayne, *Dendr. Fl.* 53. — Elliott, *Sk.* i. 470. — Torrey, *Fl. N. Y.* i. 188. — De Candolle, *Prodr.* ii. 518. — Sprengel, *Syst.* ii. 346. — Guimpel, Otto & Hayne, *Abbild. Holz.* 116, t. 92. — Hooker, *Fl. Bor.-Am.* i. 167. — Don, *Gen. Syst.* ii. 463. — Spach, *Hist. Vég.* i. 129. — Torrey & Gray, *Fl. N. Am.* i. 392. — Dietrich, *Syn.* ii. 1515. — Darlington, *Fl. Cestr.* ed. 3, 67. — Chapman, *Fl.* 114. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 50. — Koch, *Dendr.* i. 14. — Baillon, *Hist. Pl.* ii. 121. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 65. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 61. — Watson & Coulter, *Gray's Man.* ed. 6, 147.

Siliquastrum cordatum, Moench, *Meth.* 54.

A small tree, sometimes forty or fifty feet in height, with a straight trunk usually separating, ten or twelve feet from the ground, into stout branches which form an upright or often a wide flat head. The bark of the trunk is half an inch thick, and divided by deep longitudinal fissures into long narrow plates, the bright red-brown surface separating into thin scales; that of the branches is smooth and light brown or gray. The branches are slender, glabrous, somewhat geniculate, and covered during their first summer with lustrous brown bark marked by many minute lenticels, which in the second year loses its lustre and grows darker, and in the third becomes a dark or a grayish brown. The winter-buds are obtuse, an eighth of an inch long, and covered with ovate chestnut-brown imbricated scales rounded on the back and slightly ciliate on the margins. The leaves are broadly ovate, often abruptly contracted at the apex into short broad points, truncate or more or less cordate at the base, entire, five to seven-nerved, glabrous with the exception of tufts of white hairs on the lower surface in the axils of the nerves, or sometimes more or less pubescent below.[1] They are from three to five inches in length and breadth, and are borne on slender terete petioles abruptly enlarged at the two ends and from two to five inches long; the stipules are ovate, acute, membranaceous, an eighth of an inch in length, and early deciduous. The leaves turn in the autumn to a bright clear yellow. The flowers, which appear in early spring before or contemporaneously with the leaves, are half an inch long with a dark red calyx and rosy pink petals, and are borne on pedicels from a third to half an inch in length and fascicled four to eight together. The legumes are fully grown in the south by the end of May and at the north by midsummer, and are then pink or rose-color; they are unequally oblong, almost straight on the upper, and curved on the lower edge, and are from two and a half to three and a half inches long. They are produced in great quantities, and fall late in the autumn or in early winter. The seed is bright chestnut-brown and a quarter of an inch long.

Cercis Canadensis is widely distributed from the valley of the Delaware River in New Jersey[2] to the shores of Tampa Bay, northern Alabama and Mississippi, and ranges westward to Missouri, the eastern borders of the Indian Territory, Louisiana, and the valley of the Brazos River in Texas, and reappears on the northeastern slopes of the Sierra Madre of Nuevo Leon. It is a common tree in all this region in glades by the borders of swamps, and on rich bottom-lands forming, especially west of the

[1] *C. Canadensis*, var. *pubescens*, Pursh, *Fl. Am. Sept.* i. 308. — Loudon, *Arb. Brit.* ii. 659.

[2] Britton, *Final Rep. State Geologist, N. J.* ii. 90 (*Cat. Pl. N. J.*).

Alleghany Mountains, an abundant undergrowth to the forest. It grows in immense numbers and to its largest size in southern Arkansas, the Indian Territory, and eastern Texas, where in early spring, when its branches are covered with its brilliant flowers, it makes a beautiful and conspicuous feature of the landscape.

The wood of *Cercis Canadensis* is heavy, hard, although not very strong, and rather coarse grained. It contains numerous thin medullary rays, and bands of from one to three rows of open ducts clearly defining the layers of annual growth. It is rich dark brown tinged with red, with thin lighter colored sapwood composed of eight or ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.6363, a cubic foot weighing 39.65 pounds.

Cercis Canadensis was cultivated in English gardens as early as 1730,[1] and the first description of it was published by Plukenet in the *Almagestum Botanicum* in 1696.[2] The Redbud is a desirable ornament for the garden. It is very hardy far north of its native home and in regions where none of the other species of Cercis can survive; it grows rapidly in good soil, and at the end of a few years, if space is given for its free development, makes a broad-branched flat-topped tree of formal outline, handsome at all seasons of the year, and in flower a striking and delightful object.

[1] Aiton, *Hort. Kew.* ii. 47. — Loudon, *Arb. Brit.* ii. 659.

[2] *Ceratia agrestis, Virginiana, folio rotundo, minori. Fortè Siliqua sylvestris, rotundifolia, Canadensis H. R. P. Schol. Botan.* 95. — Ray, *Hist. Pl.* iii. *Dendr.* 100. *Siliquastrum Canadense*, Tournefort, *Inst.* 647. — Duhamel, *Traité des Arbres*, ii. 264. *Cercis foliis cordatis pubescentibus*, Linnæus, *Hort. Cliff.* 156; *Hort. Ups.* 99. — Clayton, *Fl. Virgin.* 47. — Royen, *Fl. Leyd. Prodr.* 463.

EXPLANATION OF THE PLATES.

Plate CXXXIII. Cercis Canadensis.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A flower, a portion of the calyx and corolla removed, enlarged.
6. A calyx, enlarged.
7. A stamen, enlarged.
8. A pistil, enlarged.
9. Vertical section of an ovary, enlarged.
10. An ovule, much magnified.

Plate CXXXIV. Cercis Canadensis.

1. A fruiting branch, natural size.
2. A legume, one of the valves removed, natural size.
3. A seed, enlarged.
4. Vertical section of a seed, enlarged.
5. Cross section of a seed, enlarged.
6. An embryo, much magnified.
7. A winter branchlet, natural size.

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— Duhamel, *Traité*

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Royen, *Fl. Leyd.*

[illegible] undergrowth to the forest. It grows in immense numbers and to [illegible] masses, the Indian Territory, and eastern Texas, where in early spring, [illegible] with its brilliant flowers, it makes a beautiful and conspicuous feature [illegible]

[illegible] *Canadensis* is heavy, hard, although not very strong, and rather coarse [illegible] thin medullary rays, and bands of from one to three rows of open ducts [illegible] layers of annual growth. It is dark brown tinged with red with thin lighter [illegible] composed of eight or ten layers of annual growth. The specific gravity of the [illegible] wood is 0.66363, a cubic foot weighing 59.65 pounds.

Cercis Canadensis was cultivated in English gardens as early as 1730,[1] and the first description of [illegible] published by Parkenson in the *Theatrum Botanicum* in 1696.[2] The Redbud is a desirable [illegible] for the garden. It is very hardy far north of its native home and in regions where none of [illegible] species of *Cercis* are native, it grows rapidly in good soil, and at the end of a few years, [illegible] given for its free development, makes a broad round-headed flat-topped tree of formal outlines [illegible] at all seasons of the year, and in flower [illegible] and delightful object.

[illegible] Ray, Hist. 1. 877. — Linnæus, Sp. Pl. 374. — Lamarck, Encyc. 1. 659. — Tournefort, Inst. 647. — Duhamel, Traité des arbres [illegible] Michaux, Hist. des Arbres, 1. 277. — Nuttall, Sylva, 1. 177. — Elliott, Sketch, 1. 536. — Torrey & Gray, Fl. N. A. 1. 403. — Darlington, Fl. Cestrica, 188. — Pursh, Fl. Am. Sept. 1. 469. — Bigelow, Am. Med. Bot. 1. 57. — Barton, Fl. Phil. 1. 13. — Eaton & Wright, N. A. Bot. 188. — Bigelow, Fl. Boston. ed. 3. 147. — Emerson, Trees and Shrubs Mass. 1. 377. — Darlington, Fl. Cestrica, ed. 2. 188. — Gray, Manual, 96. — Chapman, Fl. 72. — Wood, Class-Book, 256. — Loudon, Arb. et Frut. Brit. 2. 1107. — Hooker, Fl. Bor.-Am. 1. 136. — Torrey, Fl. N. Y. 1. 96. — Beck, Bot. 188. — Darby, Bot. Southern States, 188. — Lindley, Veg. Kingd. 688. — Torrey, Pacific Railroad Rep. 4. 149. — Sargent, Forest Trees, Tenth Census, 9. 188. — Sargent, Forest Trees, Sixth Census, 188. — Sargent, Silva, 1. 1. — Clayton, Fl. Virgin. 47. — Rafinesque, Fl. Ludov. 66.

[illegible] PLATES.

[illegible] CANADENSIS.

1. A [illegible]
2. [illegible]
3. A [illegible]
4. [illegible] of a flower, enlarged.
5. A view of a portion of the calyx and corolla removed, enlarged.
6. A calyx, enlarged.
7. A stamen, enlarged.
8. A pistil, enlarged.
9. [illegible] of an ovary, enlarged.
10. An ovary [illegible]

[illegible] CANADENSIS.

1. A [illegible]
2. A leaf [illegible], natural size.
   A seed, enlarged.
4. Ventral [illegible], enlarged.
   Cross-section of a seed, enlarged.
6. An [illegible], much magnified.
7. A [illegible], natural size.

CERCIS CANADENSIS

CERCIS TEXENSIS.

Redbud.

FLOWERS fascicled or slightly racemose. Leaves reniform.

Cercis Texensis, Sargent, *Garden and Forest*, iv. 448.
C. occidentalis, var., Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 177 (*Pl. Lindheim.* ii.). — Walpers, *Ann.* ii. 440.
C. occidentalis, Torrey, *Bot. Mex. Bound. Surv.* 58 (in part). — Hemsley, *Biol. Biol. Am. Cent.* i. 340 (in part).
C. occidentalis, var. **Texensis**, Watson, *Index*, i. 209.
C. reniformis, Watson, *Proc. Am. Acad.* xvii. 348. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 61. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 91 (*Man. Pl. W. Texas*).

A small slender tree, occasionally twenty or nearly forty feet in height, with a trunk six to twelve inches in diameter; or more often a shrub sending up many stems and forming dense thickets only a few feet high. The bark of the trunk and branches is thin, smooth, and light gray. The branchlets are glabrous and covered with minute white lenticels, and are light reddish brown during their first and second years and dark gray in their third. The leaves, which appear soon after the opening of the flowers in March, are at first light green and slightly pilose; at maturity they are subcoriaceous, dark green and lustrous on the upper, and paler and glabrous or pubescent on the lower surface, and are borne on petioles an inch and a half to two inches long and abruptly contracted at both ends. The flowers are half an inch or rather less in length, and are borne on slender pedicels fascicled in sessile clusters or occasionally racemose, and as long or sometimes twice as long as the flowers, which are rosy pink with a darker colored calyx. The legumes are from two to four inches long and from half an inch to almost an inch broad, and in form and color are hardly to be distinguished from those of *Cercis Canadensis*.

Cercis Texensis is distributed from the neighborhood of Dallas in eastern Texas to the Sierra Madre in Nuevo Leon.[1] It is very common in the valley of the upper Colorado River, and attains its greatest size on the mountains of northeastern Mexico,[2] and here and in many parts of western Texas is a conspicuous feature of vegetation, often forming extensive thickets on the limestone hills and ridges on which the Texas Redbud is found.

The wood of *Cercis Texensis* is heavy, hard, and close-grained, with numerous rather obscure medullary rays, and rows of open ducts marking the layers of annual growth. It is brown streaked with yellow, with thin lighter colored sapwood consisting of five or six layers of annual growth. The specific gravity of the absolutely dry wood is 0.7513, a cubic foot weighing 46.82 pounds.

Cercis Texensis was discovered by Jean Louis Berlandier[3] at Comancheries, in the valley of the lower Rio Grande, in November, 1828.[4]

[1] In the specimen (No. 2080) collected by Pringle in 1888 on the Sierra Madre near Monterey the lower surface of the leaves, the petioles, and the branchlets are coated with hoary canescent tomentum.

[2] C. G. Pringle, *Garden and Forest*, iii. 362.

[3] See i. 82.

[4] *Cercis Texensis* was named by Engelmann in MSS. *Cercis reniformis*, but was not published. See Scheele, *Roemer Texas*, 428, and Brewer & Watson, *Bot. Cal.* i. 161.

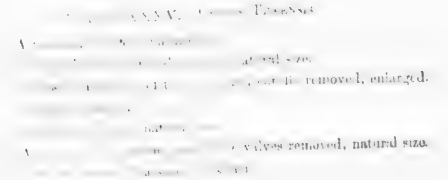
EXPLANATION OF THE PLATE.

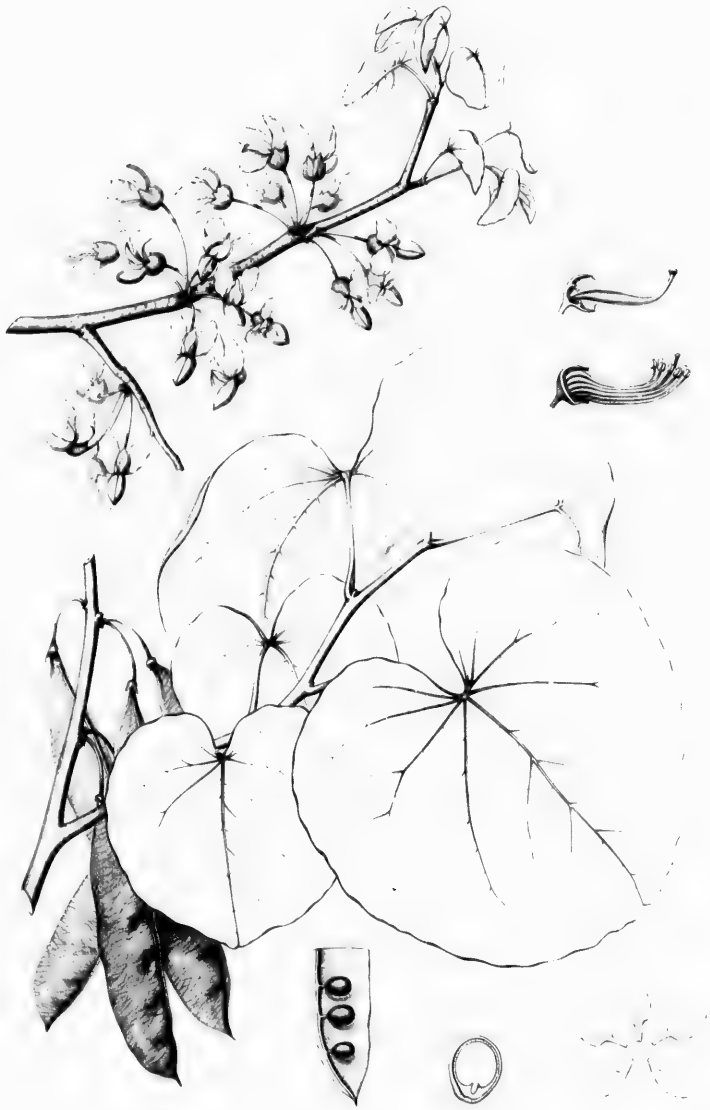
Plate CXXXV. Cercis Texensis.

1. A flowering branch, natural size.
2. The petals of a flower displayed, natural size.
3. A flower, a portion of the calyx and corolla removed, enlarged.
4. A pistil, enlarged.
5. A fruiting branch, natural size.
6. A portion of a legume, one of the valves removed, natural size.
7. Vertical section of a seed, enlarged.

EXPLANATION OF THE PLATE.

PLATE XXXV.





CERCIS TEXENSIS

PROSOPIS.

FLOWERS perfect, regular, in axillary cylindrical spikes or globose heads; calyx campanulate, 5-toothed, the teeth valvate in æstivation; petals 5, valvate in æstivation; stamens 10, free; ovary sessile or stipitate, many-ovuled. Legume linear, compressed or subterete, indehiscent. Leaves bipinnate.

Prosopis, Linnæus, *Mant.* 10. — Meisner, *Gen.* 96. — Endlicher, *Gen.* 1324. — Bentham & Hooker, *Gen.* i. 591. — Baillon, *Hist. Pl.* ii. 64.

Algarobia, Bentham, *Pl. Hartweg.* 13. — Torrey & Gray, *Fl. N. Am.* i. 399. — Endlicher, *Gen.* 1324.

Trees or shrubs, with aculeate or naked branches sometimes armed with solitary or geminate axillary spines or spinescent stipules. Leaves bipinnate with two to four or rarely many pinnæ, the pinnæ many or few-foliolate; petioles and petiolules usually furnished with minute or obscure glands; leaflets often rigid; stipules minute or wanting. Flowers usually sessile, in axillary spikes or heads. Calyx five-toothed or slightly five-lobed, deciduous. Petals connate below the middle or ultimately free, glabrous or tomentose on the inner surface towards the apex, sometimes puberulous on the outer surface, hypogynous. Stamens ten, free, inserted with the petals on the margin of a minute obscure disk adnate to the calyx-tube, those opposite the lobes of the calyx rather longer than the others; filaments filiform; anthers oblong, attached on the back below the middle, versatile, introrse, two-celled, the connective tipped with a minute deciduous gland or rarely eglandular, the cells opening longitudinally by marginal sutures. Ovary inserted in the base of the calyx, sessile or stipitate, villose or glabrous, many-ovuled; style filiform, tipped with a minute stigma; ovules suspended in two ranks from the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume linear, compressed or subterete, straight, falcate, contorted or twisted into a more or less regular spiral, indehiscent; exocarp thin or coriaceous; mesocarp thick, spongy, or hardened, rarely thin; endocarp cartilaginous or papery, inclosing the seeds individually in distinct nutlike joints, or occasionally continuous and scarcely distinguishable from the mesocarp. Seed ovate or oblong, compressed, the hilum near the base; testa crustaceous. Embryo surrounded by a layer of horny albumen; cotyledons flat, the radicle short, straight, slightly exserted.

The genus Prosopis is distributed from the southern borders of the United States to Patagonia, and occurs in tropical Africa, in the Orient, and in tropical and subtropical Asia. Sixteen or seventeen species are distinguished,[1] three of which belong to the Old World. The type of the genus, *P. spicigera*,[2] is found from Persia and Afghanistan to southern India, where in arid regions it sometimes forms extensive forests. *Prosopis Stephaniana*[3] inhabits Cyprus, the Caucasus, Persia, and Afghanistan, extending eastward as far as the Punjab, and *Prosopis oblonga*[4] Upper Guinea and the Nile-land. Two of the species found within the territory of the United States are small trees, and the third, *Prosopis cinerascens*,[5] a native of the valley of the lower Rio Grande, is a low shrub. The other American species are shrubs of Mexico and Peru, and the extratropical countries south of the equator.

[1] Bentham, *Trans. Linn. Soc.* xxx. 376 (*Rev. Mim.*). — Watson, *Proc. Am. Acad.* xxiv. 48. — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 152 (*Pl. Baja Cal.*).

[2] Linnæus, *Mant.* 68. — De Candolle, *Prodr.* ii. 446. — Boissier, *Fl. Orient.* ii. 634. — Bentham, *l. c.* — Hooker f. *Fl. Brit. Ind.* ii. 288.

[3] Kunth, *Steudel Nom. Bot.* ii. 399. — Boissier, *l. c.* 633. — Bentham, *l. c.* — Hooker f. *l. c.*

[4] Bentham, *Hooker Jour. Bot.* iv. 348; *Trans. Linn. Soc. l. c.* 377. — Oliver, *Fl. Trop. Afr.* ii. 331.

[5] Bentham, *l. c.* 381. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

Strombocarpa cinerascens, Gray, *Smithsonian Contrib.* iii. 61 (*Pl. Wright.* i.). — Walpers, *Ann.* iv. 614. — Torrey, *Bot. Mex. Bound. Surv.* 60.

The North American species produce hard durable timber. The wood of *Prosopis spicigera*, a moderate-sized tree, is used in India in making agricultural implements and carts, in buildings, and for furniture; and it is largely employed as fuel on locomotives and steamboats; the pods, like those of the North American species, are used for fodder; and in some districts of India the mealy sweet mesocarp is an important article of food, being eaten raw or cooked with vegetables.[1] This tree is worshiped by the Hindoos at the Dussera Festival.[2]

Numerous insects feed upon the leaves of the North American species, and borers often injure their stems.[3]

The generic name was formed by Linnæus from προσωπίς, employed by Dioscorides to designate the Burdock.

[1] Brandis, *Forest Fl. Brit. Ind.* 170, t. 25. — Aitchison, *Jour. Linn. Soc.* viii. 64.

[2] Brandis, *l. c.*

[3] Little is known yet of the insects which feed on the North American species of Prosopis. *Hemileuca yavapai*, Neumoegen, has been found living on one of the species (*Entomologica Americana*, iii. 107), and *Ægeria prosopis*, H. Edwards, has been taken from galls on *Prosopis juliflora* (*Papilio*, ii. 9). *Chrysobothris octocola*, Leconte, bores into the stems of various species (*Proc. Acad. Nat. Sci. Phil.* 1858, 67), and *Cyllene antennatus*, White, lives in Mesquite wood (G. H. Horn, *Trans. Am. Entomolog. Soc.* viii. 135).

The fruit and seeds of Prosopis, as well as those of the North American species of Acacia and Cercidium, are often destroyed by weevils. The pods of *Prosopis juliflora* are infested by *Bruchus prosopis*, and those of *Prosopis pubescens* by *Bruchus desertorum* (G. H. Horn, *Trans. Am. Entomolog. Soc.* iv. 311. — J. G. Jack, *Garden and Forest*, iv. 280, f. 49).

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

ALGAROBIA. Legume elongated, compressed or ultimately convex; pinnæ twelve to sixteen-foliolate . . . . . 1. P. JULIFLORA.

STROMBOCARPA. Legume thick, spirally twisted; pinnæ ten to sixteen-foliolate . . . . . 2. P. PUBESCENS.

PROSOPIS JULIFLORA.

Mesquite. Honey Locust.

LEGUME elongated, compressed or ultimately convex. Pinnæ 12 to 16-foliolate.

Prosopis juliflora, De Candolle, *Prodr.* ii. 447. — Descourtilz, *Fl. Med. Antil.* viii. 107, t. 550. — Don, *Gen. Syst.* ii. 401. — Dietrich, *Syn.* ii. 1425. — Bentham, *Trans. Linn. Soc.* xxx. 377 (*Rev. Mim.*). — Schnizlein, *Icon.* t. 277, f. 13. — Brewer & Watson, *Bot. Cal.* i. 163. — Rothrock, *Wheeler's Rep.* vi. 42, 106. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 61. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

Mimosa juliflora, Swartz, *Prodr.* 85; *Fl. Ind. Occ.* 986. — Poiret, *Lam. Dict.* Suppl. i. 76. (Err. typ. *piliflora.*)

Mimosa salinarum, Vahl, *Eclog.* iii. 35.

Acacia Cumanensis, Willdenow, *Spec.* iv. 1058.

Acacia pallida, Willdenow, *Spec.* iv. 1059.

Acacia lævigata, Willdenow, *Spec.* iv. 1059.

Acacia juliflora, Willdenow, *Spec.* iv. 1076.

Acacia furcata, Desvaux, *Jour. Bot.* v. 67.

Acacia diptera, Willdenow, *Enum.* 1051.

Mimosa pallida, Poiret, *Lam. Dict.* Suppl. i. 65.

Mimosa Cumana, Poiret, *Lam. Dict.* Suppl. i. 65.

Mimosa lævigata, Poiret, *Lam. Dict.* Suppl. i. 65.

Mimosa furcata, Desfontaines, *Cat. Hort. Paris*, ed. 2, 207.

Acacia flexuosa, Lagasca, *Elench. Hort. Matrit.* 16.

Acacia Siliquastrum, Lagasca, *Elench. Hort. Matrit.* 16.

P. horrida, Kunth, *Mim.* 106, t. 33. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 306. — De Candolle, *Prodr.* ii. 446. — Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 400. — Spach, *Hist. Vég.* i. 63. — Dietrich, *Syn.* ii. 1424.

P. pallida, Kunth, *Mim.* 106. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 309. — Sprengel, *Syst.* ii. 326. — De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424.

P. Cumanensis, Kunth, *Mim.* 106. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 310. — De Candolle, *Prodr.* ii. 447. — Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1425.

P. dulcis, Kunth, *Mim.* 110, t. 34. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 307. — De Candolle, *Prodr.* ii. 447. — Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 400. — Spach, *Hist. Vég.* i. 63. — Dietrich, *Syn.* ii. 1424.

Desmanthus salinarum, Steudel, *Nom. Bot.* i. 493.

P. inermis, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 307. — De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424.

P. Siliquastrum, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424.

P. flexuosa, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424. — Hooker & Arnott, *Hooker Bot. Misc.* iii. 203.

P. bracteolata, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1425.

P. Domingensis, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1425.

Acacia ? salinarum, De Candolle, *Prodr.* ii. 456.

P. affinis, Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 401.

P. glandulosa, Torrey, *Ann. Lyc. N. Y.* ii. 192, t. 2; *Emory's Rep.* 139; *Pacific R. R. Rep.* iv. 82. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424. — Walpers, *Rep.* i. 861. — Bentham, *Hooker Jour. Bot.* iv. 348; *Lond. Jour. Bot.* v. 81. — Watson, *King's Rep.* v. 420.

Algarobia glandulosa, Torrey & Gray, *Fl. N. Am.* i. 399; *Pacific R. R. Rep.* ii. 164. — Engelmann & Gray, *Jour. Bost. Soc. Nat. Hist.* v. 242 (*Pl. Lindheim.* i.). — Engelmann, *Wislizenus Memoir of a Tour to Northern Mexico* (*Senate Doc.* 1848) Bot. Appx. 94. — Scheele, *Roemer Texas*, 427. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 181 (*Pl. Lindheim.* ii.); *Smithsonian Contrib.* iii. 60; v. 51 (*Pl. Wright.* i., ii.); *Ives' Rep.* 11. — Torrey, *Sitgreaves' Rep.* 158; *Pacific R. R. Rep.* iv. 82; vii. 10; *Bot. Mex. Bound. Surv.* 60.

Algarobia dulcis, Bentham, *Pl. Hartweg.* 13.

P. fruticosa, Meyen, *Reise*, i. 376.

P. odorata, Torrey, *Frémont's Rep.* 313, t. 1 (excl. fruit).

A tree, occasionally forty or fifty feet in height, with a trunk rarely two feet in diameter and seven to ten feet long, but usually not more than six to twelve inches in diameter, and divided, a short distance above the ground, into many irregularly arranged crooked branches forming a loose straggling head; or occasionally, when grown under the most favorable conditions, a shapely tree with a round symmetrical head; or often a shrub with slender stems sometimes only a few inches in height. The principal roots with a large thick tap-root descend vertically to a depth sometimes of forty or fifty feet, and are supplemented by radiating horizontal roots which spread in all directions and form a dense mat

in the subsoil.[1] The bark of the trunk is thick, dark reddish brown, and divided by shallow fissures, the surface separating into short thick scales. The branchlets are slender, glabrous, or pubescent, at first pale yellow-green, and rather darker in their second year, when they are usually more or less zigzag and are often marked with minute dark lenticels and irregularly shaped red blotches. The winter-buds are obtuse and are covered with acute apiculate dark brown scales. The branches are furnished at the axils of the leaves of their first season with short thick spur-like excrescences covered with chaffy scales, and are usually armed with stout straight terete supra-axillary persistent spines which vary from half an inch to two inches in length, or the branches are sometimes unarmed. The leaves are alternate on the branchlets of the year and fascicled in the axils of those of previous years; they have two or rarely four pinnæ, and are glabrous or pubescent, and deciduous. The petiole is terete, two to four inches in length, with an abruptly enlarged glandular base, and is furnished at the apex with a minute gland and tipped with the slender subulate spinescent rachis. The pinnæ are from three to six inches long, with petioles enlarged and glandular at the base, and terete or slightly winged rachises, each bearing from eight to fifteen pairs of oblong or linear entire acute or obtuse and often apiculate rigid leaflets. These vary from one to two inches in length and from an eighth to a quarter of an inch in breadth; they are conspicuously reticulate-veined, strengthened by broad thick midribs, and are sessile or borne on short stout glandular petiolules, and are sometimes remote and sometimes placed close together, standing in all positions on the rachis, as often in vertical or oblique as in horizontal planes.[2] The stipules are linear, acute, membranaceous, and deciduous. The flowers, which are a twelfth of an inch long, are greenish white and fragrant, and are produced on short pedicels from the axils of minute scarious deciduous bracts in slender cylindrical spikes which vary from an inch and a half to four inches in length; these are densely or occasionally interruptedly flowered, and are borne on stout peduncles from half an inch to three quarters of an inch long, and when the flowers are open appear bright yellow from the numbers of largely exserted anthers. The calyx is glabrous and is barely a quarter of the length of the narrowly oblong acute petals. These are slightly puberulous or glabrous on the outer surface and covered on the inner surface towards the apex with thick white tomentum which appears as a tuft at the apex of the flower-bud. The stamens are straight or diverging and twice as long as the corolla, the large dark-colored connective of the anther cells bearing a stalked gland. The ovary is shortly stipitate and clothed with silky hairs. The flowers begin to appear in May, and are produced in successive crops until the middle of July. The legumes are linear, compressed at first, subterete at maturity, constricted between the seeds, of which there are usually from ten to twenty, straight or falcate, and contracted at the two ends, the apex being tipped with the straight or recurved remnant of the style; they vary from four to nine inches in length and from a quarter of an inch to half an inch in width. The outer coat is thin and ligneous, longitudinally veined, and pale yellow or straw-color often marked with

[1] The roots of the Mesquite appear to develop almost independently of the leaves, and often attain an enormous size on plants with stems a few inches in height and with only a small quantity of foliage. The tap-root, which is the only one of the vertical roots that grows to a large size, often descends to a great depth in search of water, and does not branch or decrease much in diameter until this is reached. The Mesquite is thus enabled to extract an unfailing supply of water from low strata, and is not dependent on the moisture of the subsoil. Its presence and condition afford almost certain indications of the depth of the water-level; when the plant attains the size of a tree this will be found within forty or fifty feet of the surface, or, when it grows as a thrifty bush, within fifty or sixty feet; when the roots are forced to descend below sixty feet, the stems are not more than two or three feet high. Sand heaped by the wind about the stems of the plants causes the development of secondary vertical roots and branches which hold more sand and earth, and gradually form mounds, often of considerable size and height, upon which the plants appear to be growing.

The value of the Mesquite is greatly increased by the remarkable development of its roots, which enables it to reach a deep water-level and flourish where no other ligneous plant can exist; these roots furnish large quantities of valuable fuel, which is dug from the ground or dragged out by oxen in pieces fifteen or twenty feet long in regions where no wood of fuel value is produced above ground. (Havard, *Am. Nat.* xviii. 454.)

The weight of the wood of the root, as shown by the result of the tests published in Volume IX. of the 10th Census of the United States, is considerably greater than the average weight of many specimens taken from trunks grown in different regions, its specific gravity being 0.8493.

[2] Havard (*l. c.* 453) found 63,660 stomata to the square inch on the upper surface of the leaflets of *Prosopis juliflora*, and 143,235 on the lower surface, as the mean of several observations.

red; this surrounds a thick spongy layer of sweet pulp in which the seeds are placed obliquely, separately inclosed in thin envelopes forming nut-like joints quadrate by mutual pressure. The seeds are oblong, flattened, with a thin light brown lustrous testa and thin horny albumen.[1]

Prosopis juliflora is distributed in the United States from the southern borders of Colorado and Utah through New Mexico, the southern borders of the Indian Territory and northern and western Texas to the Rio Grande, and through southern Nevada and Arizona to southern California. The eastern limits of its range may be represented by a line extending from a point where the thirty-seventh parallel of latitude intersects the one hundredth meridian to the neighborhood of Dallas in Texas, and then southward to the valley of the Colorado and along the Gulf at a distance of twenty or thirty miles from the coast, which it reaches near the mouth of the Rio Grande; and its western limit by a line extending from the Tejon Pass in California by Los Angeles to San Pedro on the Pacific coast. The Mesquite is generally distributed through northern Mexico[2] and Lower California,[3] and is abundant in the Andean region, extending south as far as Chile; it is widely spread in the Argentine Republic, and has become naturalized in the arid regions of southern Brazil[4] and in the drier parts of the island of Jamaica.[5]

In the United States the Mesquite attains its greatest size in those bottom-lands of the rivers of southern Arizona where it is protected from the wind and where the water-level is not far below the rich porous surface of the soil. Favored by such conditions it often forms open forests of considerable extent; it is at home on rich prairies, from which fire recurring year after year cannot drive it, on arid rocky hills, on sandy and saline flats, and on shifting sand dunes. A hot dry climate with mild winters, a small rainfall, and a clear atmosphere suits it best; but it can withstand many degrees of frost, and in tenacity of life and ability to struggle against conditions which would exterminate most plants it is not surpassed by any other tree.

The wood of *Prosopis juliflora* is heavy, hard, and close-grained, although not very strong; it contains numerous distinct medullary rays and many evenly distributed open ducts, and is rich dark brown or sometimes red, with thin clear yellow sapwood. The specific gravity of the absolutely dry wood is 0.7652, a cubic foot weighing 47.69 pounds. It is almost indestructible in contact with the soil, and is valued and largely used for fence-posts and railway ties; it furnished the underpinnings and timbers of the adobe buildings of the early inhabitants of western Texas, New Mexico, Arizona, and northern Mexico; it is sometimes used in furniture, for the fellies of heavy wheels, and for the pavements of city streets; and it affords the best and often the only fuel in the regions where it grows, burning slowly with a bright clear flame. It produces valuable charcoal, but is unsuited for the generation of steam on account of the destructive action upon boilers of the tannin[6] which it contains. The

[1] The variations in the size and shape of the leaflets of *Prosopis juliflora*, the absence or presence of spines on different branches of the same individual or at different periods of its growth, and the innumerable forms assumed by the fruit in ripening have led to the publication of a large number of species which were often established upon fragmentary specimens, and are now referred to it by Bentham as synonyms. (See Bentham, *Trans. Linn. Soc.* xxx. 378 [*Rev. Mim.*].)

[2] Hemsley, *Bot. Biol. Am. Cent.* i. 344.

[3] Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 152 (*Pl. Baja Cal.*).

[4] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 289.

[5] According to Browne (*Nat. Hist. Jam.* 252) *Prosopis juliflora*, which he called "*Mimosa diffusa, spica oblonga, siliquis longioribus compressis*," had been introduced into Jamaica from the mainland and was already (1756) flourishing "luxuriantly in many parts of the lowlands, where it is observed to rise, frequently to the height of fourteen or fifteen feet, or better." (See also Barham, *Hort. Amer.* 150. — Lunan, *Hort. Jam.* i. 156. — Macfadyen, *Fl. Jam.* 311.)

[6] An analysis of the wood of *Prosopis juliflora* made by the chemist of the Department of Agriculture of the United States shows 6.21 per cent. of tannic acid in the heartwood, 0.50 per cent. in the sapwood, and 0.50 per cent. in the bark. (W. McMurtree, *Rep. Dept. Agric.* 1873, 183.) It is almost identical with the tannic acid found in oak-galls, although it is claimed that it acts more quickly on animal tissues and penetrates hides more rapidly than either oak or sumach tannin. The color of the heartwood is due to a pigment probably associated with the tannin, the two being extricable together by hydrated ether; and Havard suggests (*Am. Nat.* xviii. 458) that the relative proportion of tannin in any log can be judged of by the extent and deepness of its color, and that, like the color, it increases with the age of the tree. An astringent decoction obtained by boiling chips of the heartwood may be used to check diarrhœa or dysentery, or by infusion to purify muddy or stagnant water. (Havard, *l. c.*)

ripe pods[1] of the Mesquite supply the Mexicans and Indians with a favorite and nutritious food, and are greedily devoured by most herbivorous animals.[2] A gum resembling gum arabic[3] exudes from its stems.

From the shores of the Gulf of Mexico to those of the Pacific Ocean the Mesquite is the most important tree of the districts immediately north and south of the boundary of the United States; it is the most valuable leguminous tree of the North American forests, and the amount and quality of the food and fuel which it produces in vast territories where both are scarce make it one of the most valuable of all trees. In spring and summer its bright green foliage and abundant fragrant flowers give life and beauty to dreary desert slopes and arid plains, and delight the eye of the traveler, who, however, in the broken and illusory shadows cast by its thin and scattered leaves, vainly seeks protection from the burning rays of the sun.[4]

The earliest botanical account of *Prosopis juliflora* was published in 1788 by the Swedish traveler Swartz, who had found it naturalized in Jamaica. It was first found within the territory of the United States, in the valley of the Canadian River near the northern limits of its distribution, in 1820, by Dr. Edwin [illegible] James,[5] the naturalist of Long's Rocky Mountain Expedition. It was introduced into England from Chile in 1832,[6] and is now cultivated in most of the warm dry parts of the world as an ornamental or fodder plant,[7] or in hedges, for which its hardiness and stout well-armed branches make it valuable.

Prosopis juliflora is easily raised from seeds,[8] which readily germinate and produce plants that grow rapidly in good soil, and at the end of four or five years form shrubs with stems several feet in height.

[1] The nutritious portion of a Mesquite pod is about fifty-three per cent. and consists of vegetable albumen, gum, and grape-sugar, with traces of fat and salts. The remainder, or nearly one half, made up of the outer and inner walls of the pod and of the seeds, is indigestible and always voided. As only about one half of their weight is assimilable, Mesquite pods furnish much less valuable fodder than oats or corn; it is rich in sugar and nitrogen but deficient in starch and salts. The unripe pods are bitter and of no value as food; when fully ripe they fall to the ground and should then be collected at once and stored in a dry place when they will keep until the crop of the following year ripens; if left upon the ground they soon deteriorate and decay.

Mesquite pods are largely consumed by Mexicans and Indians, who grind them into coarse flour which they bake, after picking out the seeds, into cakes or tomales. Mesquite atole is made by boiling the pods and pounding them in fresh water into a pulp; the liquid, which contains in suspension and solution all the nutritious portion of the fruit, is then strained and makes a pleasant and healthful beverage. An infusion of Mesquite flour can be fermented and brewed into a weak beer, once largely used by the Apache and Comanche Indians. (See Havard, *Am. Nat.* xviii. 459.)

[2] Gray, *Mem. Am. Acad.* n. ser. v. 304 (*Pl. Thurber.*).

[3] The gum which exudes from the bark of the Mesquite from May to September concretes in tears of various sizes and of a bright amber color. It is usually found on old trees with thick furrowed bark, accumulated in knot-holes and on the edges of wounds, and less commonly on smooth young stems. Sometimes the exudation does not concrete but spreads out on the bark in large flat resinous patches. Mesquite gum has the taste of gum arabic, from which it differs in not being affected by subacetate of lead; it dissolves readily in three parts of water, and makes excellent mucilage. The quantity of gum naturally produced in a season by a large tree perhaps does not exceed half a pound, although the flow can be increased by making incisions in the bark, and it is not probable that Mesquite gum will ever become an important article of commerce. (Rosenthal, *Syn. Pl. Diaphor.* 1052. — *Rep. Dept. Agric. U. S.* 1872, 452. — Havard, *l. c.*)

[4] *Prosopis juliflora* is called Algaroba and its pods Algarobo by the Spanish-speaking inhabitants of Central and South America.

[5] See ii. 96.

[6] Loudon, *Arb. Brit.* ii. 661. — Nicholson, *Dict. Gard.*

[7] F. Mueller, *Select Plants readily eligible for Industrial Culture or Naturalization in Victoria*, 185. — Naudin, *Manuel de l'Acclimateur*, 439.

[8] A large proportion of the seeds do not grow without aid, through their failure to find suitable conditions for germination. Many decay where they fall, or are destroyed by insects, and the spontaneous growth of seedlings occurs only in favorable seasons at irregular intervals of years. The principal agencies for disseminating the seeds are water which rushes down gulches and arroyos after heavy rains, and carries the pods to the banks and bottom-lands of rivers, where they find conditions favorable for germination, as the Mesquite forests common in such situations attest, and herbivorous animals which void the seeds without having destroyed their vitality. The seedlings usually spring up in clusters, owing to the germination of several of the seeds from a single pod; on rich land the strongest of these takes the lead, gradually destroying the others, and forms a tree; on higher and drier land several of the seedlings develop equally and form a cluster of stems more or less united at the base.

The Mesquite grows rapidly in good soil during the first four or five years of its life. Later its increase is slow; in thirty years it may form a stem seven or eight inches in diameter which during the next fifty years may, under favorable conditions, increase three or four inches. Trunks more than a foot in diameter are probably over a hundred years old. (Havard, *l. c.* 456.)

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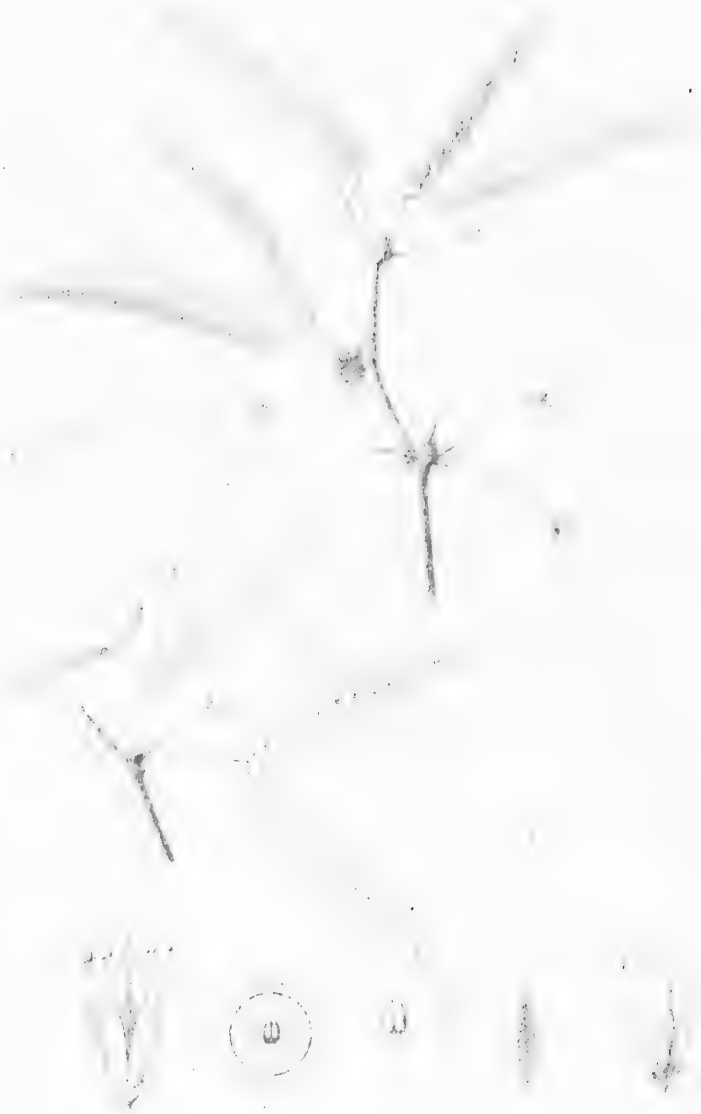
EXPLANATION OF THE PLATES.

Plate CXXXVI. Prosopis juliflora.

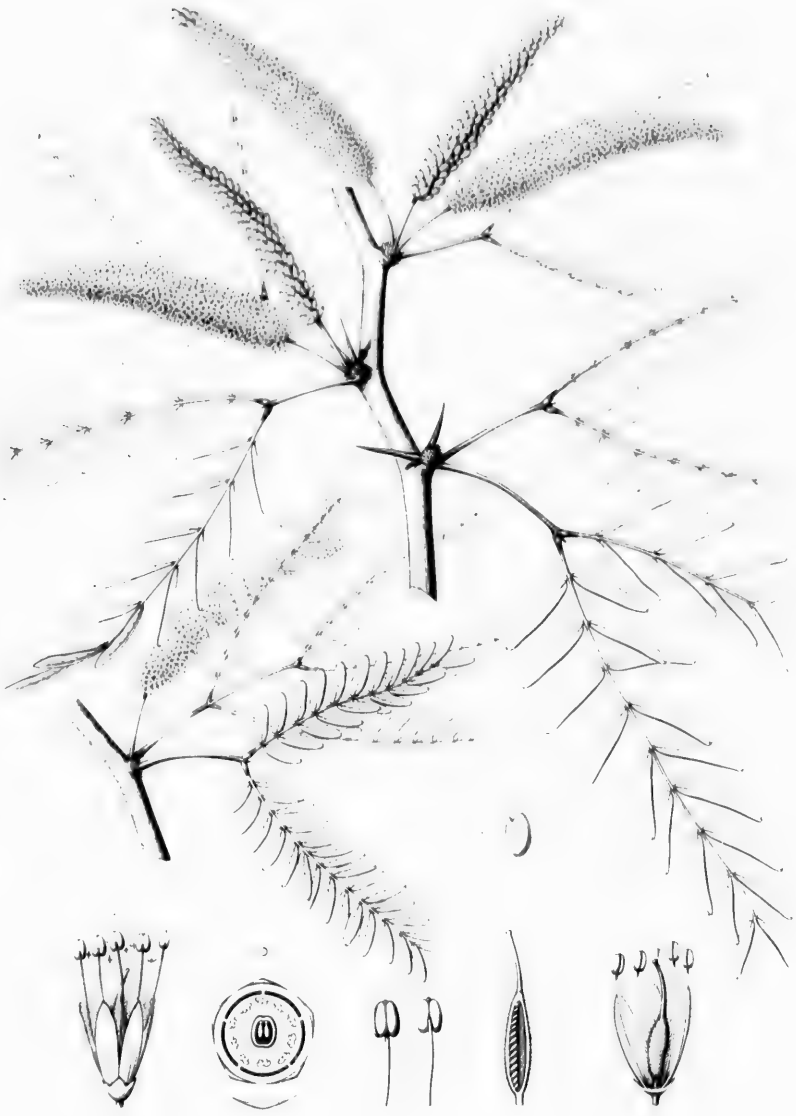
1 and 2. Flowering branches, natural size.
3. Diagram of a flower.
4. A flower, enlarged.
5. Vertical section of a flower, enlarged.
6. Front and back view of a stamen, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.

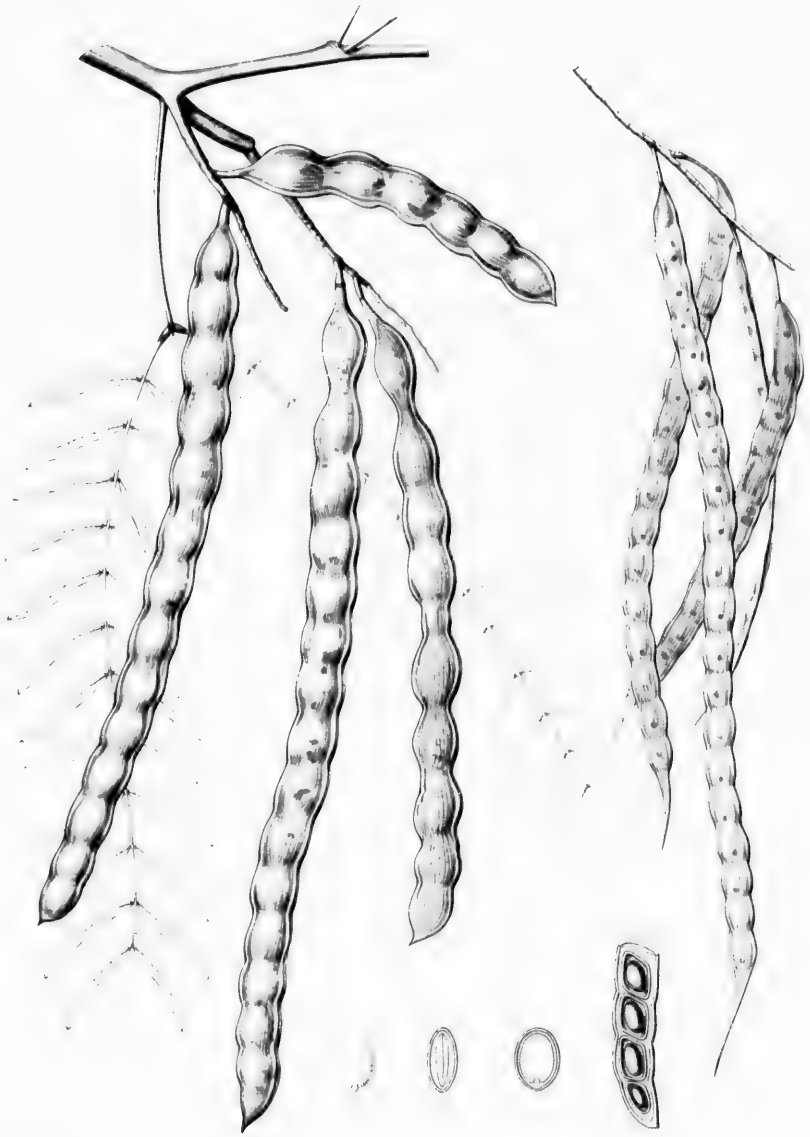
Plate CXXXVII. Prosopis juliflora.

1. A fruiting branch, natural size.
2. A cluster of half-grown fruit, natural size.
3. Vertical section of a portion of a legume, natural size.
4 and 5. Vertical sections of a seed, enlarged.
6. An embryo, magnified.



EXPLANATION OF THE PLATES





PROSOPIS PUBESCENS.

Screw Bean. Screw Pod Mesquite.

LEGUME thick, spirally twisted. Pinnæ 10 to 16-foliolate.

Prosopis pubescens, Bentham, *Lond. Jour. Bot.* v. 82; *Trans. Linn. Soc.* xxx. 380 (*Rev. Mim.*). — Walpers, *Ann.* i. 259. — Watson, *King's Rep.* v. 420. — Brewer & Watson, *Bot. Cal.* i. 163. — Rothrock, *Wheeler's Rep.* vi. 42, 107. — Hemsley, *Bot. Biol. Am. Cent.* i. 344. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 62. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

P. odorata, Torrey, *Frémont's Rep.* 313, t. 1 (excl. flowers).

P. Emoryi, Torrey, *Emory's Rep.* 139.

Strombocarpa pubescens, Gray, *Smithsonian Contrib.* iii. 60; v. 51 (*Pl. Wright.* i., ii.); *Ives' Rep.* 9. — Torrey & Gray, *Pacific R. R. Rep.* ii. 263. — Torrey, *Pacific R. R. Rep.* iv. 11, 20, 82; v. 360, t. 4; vii. pt. iii. 10; *Bot. Mex. Bound. Surv.* 60.

Strombocarpa odorata, Torrey, *Sitgreaves' Rep.* 158.

A small tree, rarely twenty-five or thirty feet in height, with a slender trunk sometimes a foot in diameter; or more often a tall many-branched shrub. The bark of the trunk is thick and light brown tinged with red, and exfoliates in long thin persistent ribbon-like scales.[1] The branches are terete, armed with stout rigid geminate supra-axillary spines; they are canescently pubescent or glabrate when they first appear, but glabrous in their third year, when they are covered with light red-brown bark. The leaves are alternate on the young shoots and fascicled in the axils of the leaves of the previous years, canescently pubescent, and deciduous; they are two or three inches long, each with a slender petiole from a third to two thirds of an inch in length bearing a minute gland near the apex, which is tipped with a small spinescent rachis, and two pinnæ each an inch and a half or two inches long with five or eight pairs of oblong or somewhat falcate acute sessile or shortly petiolulate leaflets, often apiculate, conspicuously reticulate-veined, and from a third to two thirds of an inch in length and an eighth of an inch in breadth. The stipules are spinescent and deciduous. The flowers, which begin to open in early spring, are produced in successive crops, and are greenish white; they are sessile from the axils of minute scarious deciduous bracts, and are borne in dense or interrupted cylindrical pedunculate spikes two or three inches in length. The calyx is obscurely five-lobed, pubescent on the outer surface, one third or one fourth as long as the narrow acute petals coated on the inner surface near their apex with thick white tomentum, and slightly puberulous on the outer surface. The ovary and young fruit are covered with pale tomentum. The legumes, which are borne in dense racemes, are sessile and are twisted with from twelve to twenty turns into a narrow straight spiral one or two inches in length. The outer coat of the legume is thin and woody and of a pale straw color; it incloses the thick sweet pulp of the mesocarp in which are the seeds, wrapped in separate envelopes and flattened by mutual pressure. The seeds are obovate, a sixteenth of an inch long, with a thick very hard pale brown testa and thin horny albumen. The fruit ripens throughout the summer, and falls in the autumn.

Prosopis pubescens is common in the valley of the Rio Grande in western Texas, from the mouth of the Devil's River to El Paso; it extends westward through New Mexico and Arizona, and in California through the arid region of the Colorado basin to San Diego County; it reaches the southern borders of Utah and Nevada, and extends southward into northern Mexico. It occupies sandy or gravelly bottom-lands, and attains its greatest size in the United States in the valleys of the lower Colorado and Gila rivers.

[1] The bark on an old trunk of *Prosopis pubescens* has a shaggy appearance like that of a very old Grape-vine or of a large-stemmed *Cowania Mexicana*.

The wood of *Prosopis pubescens* is heavy, and exceedingly hard and close-grained, but brittle and not very strong. It contains numerous thin medullary rays and many evenly distributed open ducts, and is light brown with thin lighter colored sapwood composed of six or seven layers of annual growth. The specific gravity of the absolutely dry wood is 0.7609, a cubic foot weighing 47.42 pounds. It is somewhat employed for fencing, and makes excellent fuel. The pods are used for fodder, and are sweet and nutritious, although their small size and the hardness of the seeds make them less valuable than those of the Mesquite.[1]

Prosopis pubescens[2] was discovered by Frémont in the Mohave Desert in 1843, during his second transcontinental journey.

[1] Havard, *Proc. U. S. Nat. Mus.* viii. 499.

[2] *Prosopis pubescens* is called Tornillo by the Mexicans.

EXPLANATION OF THE PLATE.

PLATE CXXXVIII. PROSOPIS PUBESCENS.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A stamen, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a portion of a legume, enlarged.
7. Vertical section of a seed, enlarged.
8. A seed, enlarged.
9. Vertical section of a seed, enlarged.
10. An embryo, magnified.

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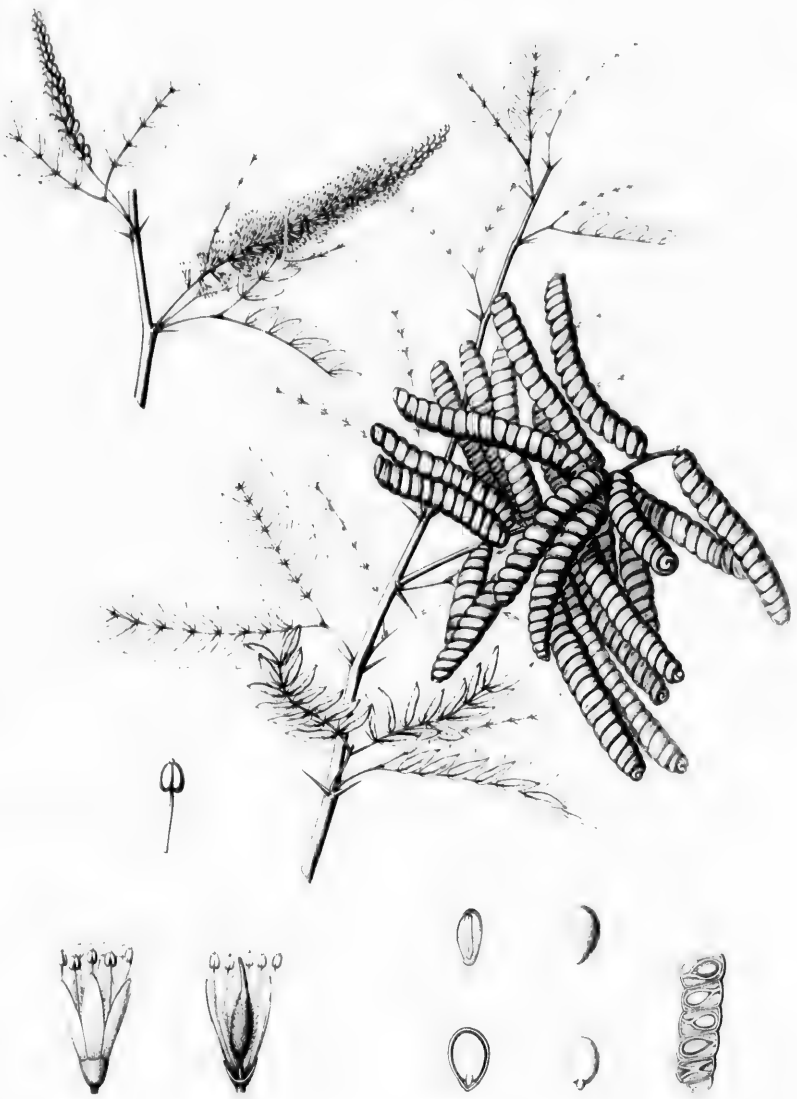
EXPLANATION OF PLATE



PROSOPIS PUBESCENS

LEUCÆNA.

Flowers in globular heads; calyx 5-toothed, the teeth valvate in æstivation; petals 5, valvate in æstivation, free; stamens 10, free; ovary stipitate, many-ovuled. Legume broadly linear, plano-compressed, 2-valved. Leaves abruptly bipinnate.

Leucæna. Bentham, *Hooker Jour. Bot.* iv. 416. — Meisner, *Gen.* pt. ii. 353. — Bentham & Hooker, *Gen.* i. 594. — Baillon, *Hist. Pl.* ii. 67.

Trees or shrubs, with branches usually unarmed. Leaves alternate, persistent, bipinnate, petiolate, the petioles often furnished with a conspicuous gland below the lower pair of pinnæ; leaflets small, in many pairs, or few, large, and oblique; stipules setaceous, minute, or ample, deciduous, rarely becoming spinescent and persistent.[1] Flowers white, mostly perfect, sessile in the axils of small bractlets, imbricated in globose pedunculate heads, the peduncles in axillary fascicles or in leafless terminal racemes, sometimes bibracteate near the apex. Calyx tubular-campanulate, minutely five-toothed, deciduous. Petals five, acute or rounded at the apex, narrowed at the base, hypogynous. Stamens ten, free, inserted under the ovary, exserted; filaments filiform; anthers ovate, oblong, or globose, eglandular, attached on the back near the middle, versatile, usually pilose, two-celled, the cells opening longitudinally. Ovary stipitate, many-ovuled, contracted into a long slender style; stigma terminal, minute, slightly dilated; ovules attached in two ranks on the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume many-seeded, stipitate, linear, compressed, tipped with the remnants of the style, dehiscent, the valves thickened on the margins, rigid, membranaceous, continuous within; exocarp thin and papery, dark-colored, the endocarp rather thicker, woody, pale brown. Seed obovate, compressed, transverse, the hilum near the base; funicle long and slender; testa thin, crustaceous, brown and lustrous. Embryo inclosed on its two sides by a thin layer of horny albumen; cotyledons oval, flat, the radicle straight, slightly exserted.

Leucæna is represented by nine or ten species.[2] One[3] inhabits the islands of the Pacific Ocean from New Caledonia to Tahiti, and the others the warmer parts of America, where they are distributed from western Texas through Mexico to Lower California and to Central America, Peru, Venezuela, and San Domingo. Three species occur within the territory of the United States. *Leucæna retusa*[4] is a slender shrub, abundant in some parts of Texas west of the Colorado River and reaching the borders of New Mexico; the others are small trees.

Leucæna is not known to possess useful properties.

The genus was established by Bentham to receive a number of plants previously referred to Acacia, which they resemble in habit and in the appearance of the fruit; this, however, in the character of the valves and in the albumen of the seeds approaches the fruit of Desmanthus rather than that of Acacia, while the flowers are similar to those of Mimosa.

The generic name, from λευκαίνω, refers to the color of the flowers.

[1] The stipules of *Leucæna Greggii* (Watson, *Proc. Am. Acad.* xxiii. 272), a small tree of northern Mexico, are triangular, ovate, and contracted into long slender points which become rigid and spinescent, and remain on the branches for at least a year as slender geminate spines, sometimes a third or nearly half an inch in length. There are traces of similar spinescent stipules also on *Leucæna macrophylla* (Bentham, *Bot. Voy. Sulphur*, 90).

[2] Bentham, *Trans. Linn. Soc.* xxx. 444 (*Rev. Mim.*). — Watson, *l. c.*

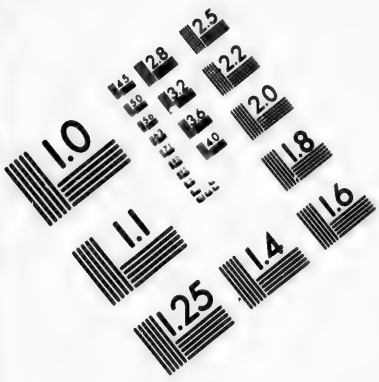
[3] *Leucæna glandulosa.*

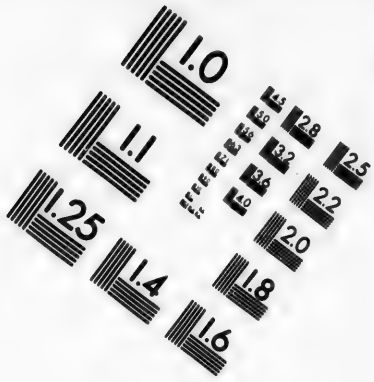
L. Fosteri, Bentham, *Hooker Lond. Jour. Bot.* v. 94; *Trans. Linn. Soc.* xxx. 442.

Mimosa glandulosa, Foster, *Prodr.* 92.

Acacia glandulosa, Guillemin, *Ann. Sci. Nat.* ser. 2, vii. 360.

[4] Bentham; Gray, *Smithsonian Contrib.* iii. 64 (*Pl. Wright.* i.); *Trans. Linn. Soc.* xxx. 443. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 98 (*Man. Pl. W. Texas*).





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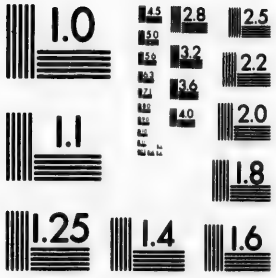

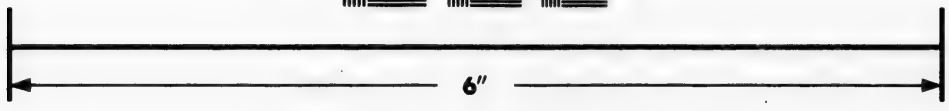

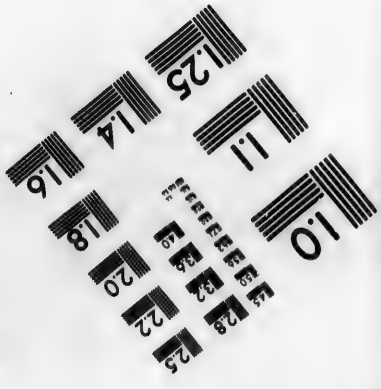

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CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Branchlets slightly tomentose or glabrous; peduncles bibracteate at the apex; pinnæ twenty to forty-foliolate . . . . . 1. L. GLAUCA.

Branchlets pulverulent-tomentose; peduncles ebracteolate; pinnæ sixty to one hundred and twenty-foliolate . . . . . 2. L. PULVERULENTA.

LEUCÆNA GLAUCA.

BRANCHLETS slightly tomentose or glabrate at maturity. Leaves 16 to 18-pinnate, the pinnæ 20 to 40-foliolate.

Leucæna glauca, Bentham, *Hooker Jour. Bot.* iv. 416; *Trans. Linn. Soc.* xxx. 443 (*Rev. Mim.*). — Walpers, *Rep.* i. 884. — Dietrich, *Syn.* v. 477. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 62. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 98 (*Man. Pl. W. Texas*).

Mimosa glauca, Linnæus, *Spec.* 520. — Persoon, *Syn.* ii. 265. — Poiret, *Lam. Dict.* Suppl. i. 75.

Mimosa leucocephala, Lamarck, *Dict.* i. 12.

Acacia glauca, Willdenow, *Spec.* iv. 1075. — De Candolle, *Prodr.* ii. 467. — Sprengel, *Syst.* iii. 139. — Don, *Gen. Syst.* ii. 418.

Acacia biceps, Willdenow, *Spec.* iv. 1075. — De Candolle, *Prodr.* ii. 467. — Don, *Gen. Syst.* ii. 418.

Acacia frondosa, Willdenow, *Spec.* iv. 1076. — De Candolle, *Prodr.* ii. 468.

Mimosa biceps, Poiret, *Lam. Dict.* Suppl. i. 75.

Mimosa frondosa, Poiret, *Lam. Dict.* Suppl. i. 76.

Acacia leucocephala, Link, *Enum.* ii. 444. — De Candolle, *Prodr.* ii. 467. — Sprengel, *Syst.* iii. 139. — Don, *Gen. Syst.* ii. 418.

A slender tree, with graceful spreading foliage, occasionally rising to the height of twenty or thirty feet, with a stem three or four inches in diameter; or more often a broad shrub sending up many stems from the ground. The bark of the trunk is three eighths of an inch thick, slightly ridged and dark brown, the surface being broken into short persistent scales. The branchlets when they first appear are coated with short pale pubescence, which gradually disappears, and in their second year they are glabrate or only slightly puberulous. The leaves are ten or twelve inches long and six or eight inches broad, with stout terete petioles enlarged at the base and an inch and a half to three inches in length, sometimes eglandular and sometimes on the same individual furnished with a large conspicuous dark gland opposite the lower pair of pinnæ or between these and its base. The stipules are minute, subulate, and caducous. The pinnæ are remote and three or four inches in length, with entire acute sessile or shortly petiolulate leaflets; these are oblique or unequal at the base, and from a third to half of an inch long, paler on the lower than on the upper surface, and at maturity occasionally slightly pilose along the margins and on the under surface; their midribs are broad and orange-colored for a third of their length, and narrow and obscure above the middle of the blade. The flower-heads are ovate before anthesis and globose at maturity, two thirds of an inch in diameter, and borne on stout pubescent peduncles; these are furnished at the apex with two irregularly three-lobed pubescent bracts, and are solitary or fascicled two or three together in the axils of the upper leaves, or are arranged in short terminal racemes, the branches springing from the axils of small scarious bracts. The flowers are numerous, sessile, and produced from the axils of minute peltate bractlets borne on long slender stalks which lengthen with the growing buds; these are oblong, obtuse, and densely coated with pale tomentum. The calyx is a twelfth of an inch long, very short-toothed, covered with pale tomentum, and half the length of the petals, which are narrow, acute, and rounded at the apex. The stamens are twice as long as the petals and have slender filaments and large oval bright yellow pilose anthers. The ovary is glabrous or often more or less covered with thin scattered hairs. The legumes are from four to seven inches long and from a half to two thirds of an inch broad, obtuse or acute at the apex, long-stalked, and furnished with a short recurved point; they are pubescent until nearly half-grown, and at maturity are bright chestnut-brown and glabrous or somewhat puberulous towards the base. Two or three or sometimes as many as ten or twelve, often of different lengths, are produced together on a single peduncle abruptly and conspicuously thickened at the apex. The seeds are obovate, two thirds of an inch long, rounded at the apex and contracted at the base; the testa is thin, bright chestnut-brown, and lustrous.

Leucæna glauca is probably a native of the warmer parts of the New World; but it has been cultivated so long and has now established itself so firmly in most of the tropical countries of both hemispheres that its origin is uncertain. It occurs in western Texas from San Saba to the valley of the Devil's River in many localities so remote from human habitations that it hardly seems possible it could have reached them through the agency of man. It is widely scattered through Mexico and Central America,[1] and many of the countries of South America, extending at least as far south as southern Brazil.[2] It has become naturalized in most of the West India and Bahama Islands[3] and on Key West in Florida,[4] and is now common in tropical Africa[5] and Asia,[6] and on the islands of the Pacific Ocean.[7] In Texas and northern Mexico *Leucæna glauca* inhabits dry rocky hillsides and the sides of depressions in the desert, or is occasionally found near the borders of small streams.

The wood of *Leucæna glauca* is heavy, hard, and close-grained, and contains many small regularly distributed open ducts. The layers of annual growth and the medullary rays are hardly distinguishable. It is rich brown streaked with red, with thin clear yellow sapwood. The specific gravity of the absolutely dry wood is 0.9235, a cubic foot weighing 57.55 pounds.

Leucæna glauca appears to have been first described in 1690 by Kiggelaer[8] in his catalogue of the plants cultivated in the garden of Simon van Beaumont, of Dordrecht, and in the same year was in cultivation in the gardens of Hampton Court.[9] The beauty of its large pale finely divided leaves, its showy heads of flowers produced in the tropics throughout the year, and its handsome fruit, must early have made *Leucæna glauca* a favorite garden plant in many warm countries where its vigorous constitution, the ability of its seeds to germinate under trying conditions, and its rapid growth have enabled it to secure a foothold and gradually spread itself over wide areas.

[1] Hemsley, *Bot. Biol. Am. Cent.* i. 351.

[2] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 391.

[3] Grisebach, *Fl. Brit. W. Ind.* 220. — Sauvalle, *Fl Cub.* 35.

[4] Chapman, *Fl.* ed. 2, Suppl. 619.

[5] Oliver, *Fl. Trop. Afr.* ii. 337.

[6] Wight & Arnott, *Prodr. Fl. Ind.* 276. — Bentham, *Fl. Hongk.* 100. — Hooker f. *Fl. Brit. Ind.* ii. 290.

[7] Hillebrand, *Fl. Haw. Is.* 114.

[8] *Acaciæ simulis Americana non spinosa, floribus globosis albis ramosis*, 3.

Acacia, Buxi foliis rotundioribus, floribus albis, siliqua lata compressa, Catesby, *Nat. Hist. Car.* ii. 42, t. 42.

Mimosa arborescens Americana non spinosa, pinnis Acaciæ latioribus inferne glaucis, flore albo, Breyn, *Prodr.* ed. 1739, 83.

Mimosa inermis, foliis duplicato-pinnatis: partialibus utrinque senis pluribusve, siliquis planis membranaceis, Royen, *Fl. Leyd. Prodr.* 472.

Acacia non spinosa, flore albo, foliorum pinnis latiusculis glabris, siliquis longis planis, Miller, *Dict. Icon.* 4, t. 4. — Trew, *Pl. Ehret*, 9, t. 36.

[9] Aiton, *Hort. Kew.* iii. 441. — Loudon, *Arb. Brit.* ii. 665.

EXPLANATION OF THE PLATE.

PLATE CXXXIX. LEUCÆNA GLAUCA.

1. A flowering branch, natural size.
2. Diagram of a flower.
2a. A flower-bud with its bractlet, enlarged.
3. A flower, enlarged.
4. A stamen, enlarged.
5. A pistil, enlarged.
6. Vertical section of an ovary, enlarged.
7. An ovule, much magnified.
8. A portion of a legume, one of the valves removed, natural size.
9. Vertical section of a seed, natural size.
10. Cross section of a seed, enlarged.
11. An embryo, magnified.

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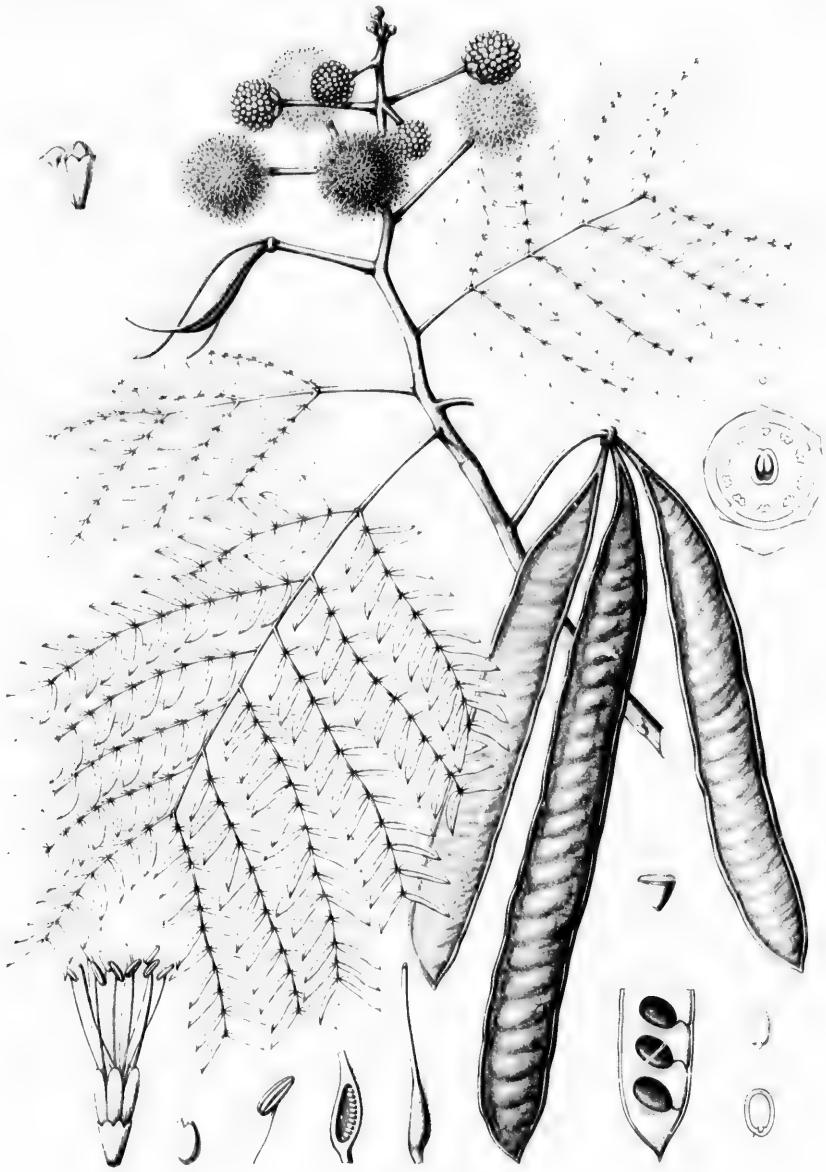

LEUCÆNA PULVERULENTA.

Mimosa.

BRANCHLETS pulverulent-tomentose. Peduncle ebracteolate. Leaves 30 to 36-pinnate, the pinnæ 60 to 120-foliolate.

Leucæna pulverulenta, Bentham, *Hooker Lond. Jour. Bot.* iv. 417; *Trans. Linn. Soc.* xxx. 443 (*Rev. Mim.*). — Dietrich, *Syn.* v. 477. — Hemsley, *Bot. Biol. Am. Cent.* i. 351. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 63; *Garden and Forest*, ii. 388, f. 122. — C. G. Pringle, *Garden and Forest*, ii. 393. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 98 (*Man. Pl. W. Texas*).

Acacia pulverulenta, Schlechtendal. *Linnæa*, xii. 571.

Acacia æsculenta, Martens & Galeotti, *Bull. Acad. Brux.* x. pt. ii. 312.

A tree, fifty or sixty feet in height, with a straight trunk eighteen or twenty inches in diameter, separating, twenty or thirty feet from the ground, into slender spreading branches which form a loose round handsome head. The bark of the trunk is a quarter of an inch thick, bright cinnamon-brown, and roughened with thick persistent scales. The branchlets when they first appear are more or less striately grooved, and are thickly coated with pulverulent tomentum which, however, soon disappears, and at the end of a few weeks they become terete, pale cinnamon-brown, and only slightly puberulous. The leaves are from four to seven inches long and three or four inches broad, with fifteen to eighteen pairs of pinnæ, slender petioles usually marked with a large dark oblong gland between the somewhat enlarged base and the lowest pair of pinnæ, and minute caducous stipules. When the leaves unfold they are covered, like the peduncles and flower-buds, with dense hoary tomentum, and at maturity are puberulous on the petioles and rachises. The leaflets are linear, acute at the apex, rather oblique at the base by the greater development of the upper side, sessile or very short-petiolulate, pale bright green, and from a sixth to a quarter of an inch in length. The flower-heads, which are half an inch or rather more in diameter, appear in succession, as the branches grow, from early spring to midsummer, and are borne on slender peduncles an inch or an inch and a half in length fascicled in the axils of the upper leaves of the branchlets, which, when the tree is in flower, thus appear to terminate in leafy racemes one or two feet long. The flowers are produced from the axils of minute clavate scarious bractlets. The calyx is slightly five-toothed and a quarter as long as the acute petals, which, like these, are pilose on the outer surface. The stamens are twice the length of the petals, with glabrous oblong anthers. The ovary is coated with long pale hairs. The legumes, which are of different lengths and produced two or three together on a common peduncle thickened at the apex, are conspicuously thick-margined, four to fourteen inches in length, long-stalked, and tipped with short straight or recurved points. The seeds are five sixteenths of an inch long with a dark lustrous coat.

Leucæna pulverulenta grows in Texas for a few miles along the Rio Grande near its mouth; it is more abundant from Matamoras to Monterey in Nuevo Leon, and has also been collected in Mexico on the banks of the Misantla River near San Antonio, at Orizaba and Cordova and near the City of Mexico. In the valley of the lower Rio Grande *Leucæna pulverulenta* is not common, being found only in a few places on the banks of the river or on the borders of lagoons and small streams, always growing in rich moist soil, and usually associated with the beautiful Texas Elm, which hardly overtops it.

The wood of *Leucæna pulverulenta* is heavy, hard, and very close-grained, and contains numerous thin conspicuous medullary rays, and many small regularly distributed open ducts. It is rich dark brown, with thin clear yellow sapwood composed of two or three layers of annual growth. The specific gravity of the absolutely dry wood is 0.6732, a cubic foot weighing 41.95 pounds. It is considered

more valuable than the wood of any other tree of the lower Rio Grande valley, and is sometimes manufactured into lumber, although the large trunks are often hollow or defective.

Leucæna pulverulenta was discovered by Jean Louis Berlandier[1] in Nuevo Leon in 1830. It is the most beautiful of the Mimosa-like trees which grow naturally within the territory of the United States, and has occasionally been planted for shade and ornament in the towns of the lower Rio Grande valley, which it decorates with its handsome trunks, graceful feathery foliage, and abundant flowers. In cultivation it grows with great rapidity;[2] and it may be expected to flourish in southern Europe, where it was introduced in 1889 through the Arnold Arboretum, in southern California, and other warm countries.

[1] See i. 82.

[2] In Matamoras trees believed to have been planted not more than twenty-five years ago are thirty or forty feet high, with fine spreading tops.

EXPLANATION OF THE PLATE.

PLATE CXL. LEUCÆNA PULVERULENTA.

1. A flowering branch, natural size.
2. A portion of a head of flowers, slightly enlarged.
3. A flower with its bractlet, enlarged.
4. A pistil, enlarged.
5. Vertical section of an ovary, enlarged.
6. A cluster of legumes, natural size.
7. A portion of a legume, one of the valves removed, natural size.
8. Vertical section of a seed, enlarged.
9. An embryo, magnified.

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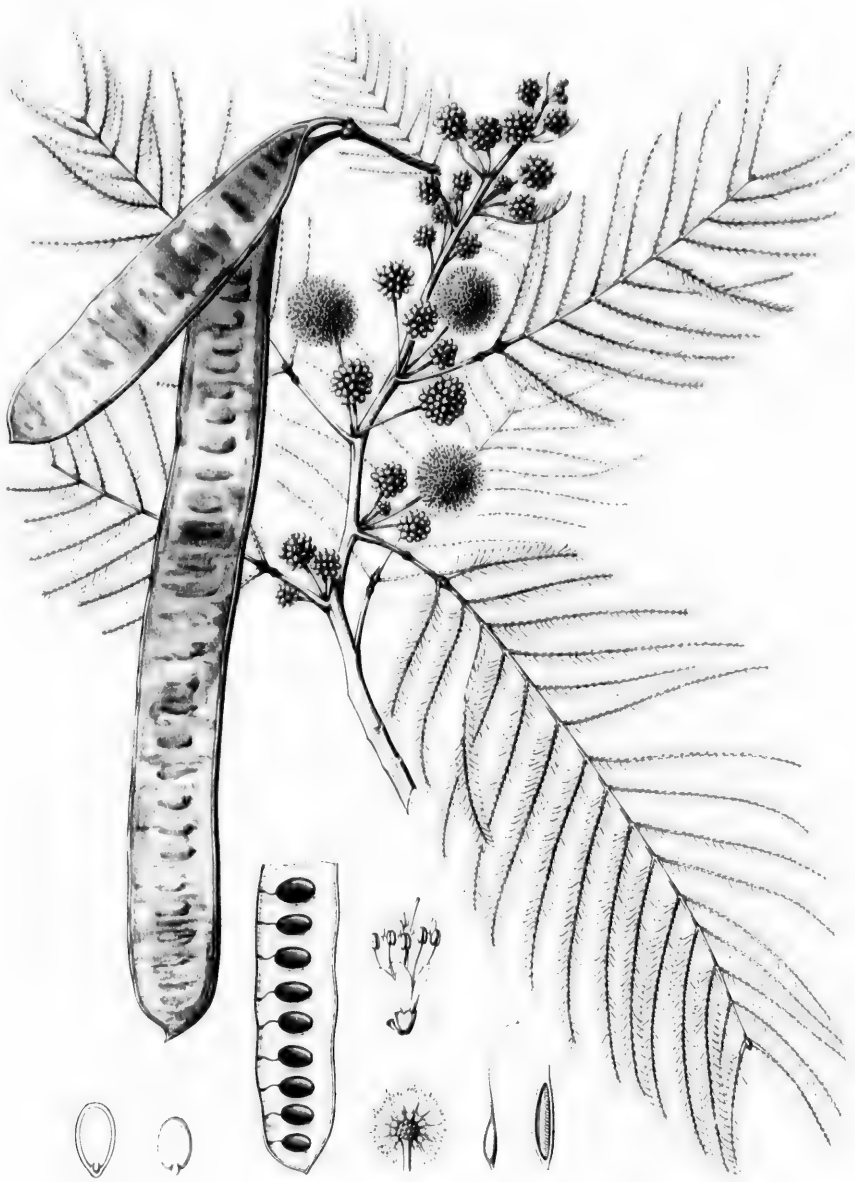

ACACIA.

Flowers perfect or polygamous, in globose heads or cylindrical spikes; calyx 4 or 5, rarely 3-parted, the divisions valvate in æstivation, or sometimes almost wanting; petals as many as the divisions of the calyx, valvate in æstivation; stamens indefinite, free or slightly connected at the base; ovary 2 or many-ovuled. Legume 2-valved or indehiscent. Leaves bipinnate.

Acacia, Adanson, *Fam. Pl.* ii. 319. — Meisner, *Gen.* 96. — Endlicher, *Gen.* 1326. — Bentham & Hooker, *Gen.* i. 594. — Baillon, *Hist. Pl.* ii. 68.
Vachellia, Wight & Arnott, *Prodr. Fl. Ind.* 272. — Meisner, *Gen.* 96. — Endlicher, *Gen.* 1326.
Aldina, E. Meyer, *Comm. Pl. Afr.* i. 171 (not Adanson nor Endlicher).
Farnesia, Gasparini, *Descr. Nuov. Gen. Leg.*
Tetracheilos, Lehmann, *Pl. Preiss.* ii. 368.
Chithonanthus, Lehmann, *Pl. Preiss.* ii. 368.
Arthrosprion, Hasskarl, *Retzia*, i. 212.

Trees, shrubs, or occasionally herbs, with unarmed aculeate or spinescent branches. Leaves bipinnate; leaflets usually small, in many pairs; or reduced to simple phyllodia or dilated petioles; stipules spinescent or inconspicuous, rarely membranaceous. Peduncles axillary, solitary, or fascicled, or panicled at the ends of the branches, generally furnished, either at the apex, towards the middle, or near the base, with two short connate scale-like bracts. Flowers perfect or often polygamous, in globose heads or cylindrical spikes, small, generally yellow or greenish white, in the axils of minute linear bractlets more or less dilated and often peltate at the apex. Calyx campanulate, dentate, lobed or divided into distinct sepals sometimes reduced to minute hairs. Petals more or less united, rarely free, very rarely wanting. Stamens numerous, usually more than fifty, exserted, free or slightly and irregularly united at the base, inserted under or just above the base of the ovary; filaments filiform; anthers small, attached on the back, versatile, introrse, two-celled, the cells opening longitudinally; pollen grains generally aggregated into two to four masses in each cell. Ovary sessile or stipitate, two or many-ovuled, contracted into a long slender style terminating in a minute stigma; ovules suspended from the inner angle of the ovary, two-ranked, superposed, anatropous, the micropyle superior. Legume ovate, oblong or linear, straight, falcate or variously twisted, flat or nearly cylindrical, membranaceous, coriaceous or woody, two-valved or indehiscent, continuous or variously divided within, very rarely separating into one-seeded joints. Seed transverse or longitudinal, usually ovate, compressed, destitute of albumen; funicle filiform or thick, colored, straight or twice or thrice folded upon itself, sometimes entirely surrounding the seed, often dilated at the apex into a more or less flat aril; testa thick, crustaceous, generally marked on the centre of each face of the seed with an oval or horseshoe-shaped depression or opaque spot or ring sometimes very obscure. Embryo filling the cavity of the seed; cotyledons oval, flat, the radicle straight, included, slightly exserted.

Acacia is generally distributed through the warmer parts of the world, especially in regions of scanty rainfall, and seems to have abounded in Europe towards the end of the Lower Eocene period.[1] No less than four hundred and thirty-two species are now distinguished.[2] Australia, the headquarters of the genus, contains nearly three hundred species;[3] they abound in tropical[4] and southern Africa[5] and in northern Africa and the Orient,[6] in all the warmer regions of southern Asia,[7] in the islands of

[1] Saporta, *Origine Paléontologique des Arbres*, 320.
[2] Bentham, *Trans. Linn. Soc.* xxx. 444 (*Rev. Mim.*).
[3] Bentham, *Fl. Austral.* ii. 301.
[4] Oliver, *Fl. Trop. Afr.* ii. 337.
[5] Harvey & Sonder, *Fl. Cap.* ii. 279.
[6] Boissier, *Fl. Orient.* ii. 635.
[7] Thwaites, *Enum. Pl. Zeylan.* 99. — Hooker f. *Fl. Brit. Ind.* ii. 292. — Hemsley, *Jour. Linn. Soc.* xxiii. 215.

the south Pacific,[1] in tropical and subtropical America,[2] in the West Indies,[3] Central America, and Mexico,[4] and the desert regions adjoining the southern boundary of the United States, where eleven or twelve species occur.[5] Three of these are small trees; the others are large or small shrubs.[6]

Acacia is astringent, and many species, especially those of Australia, yield valuable tan-barks.[7] Gum arabic[8] is produced by different species of African, Indian, and Australian Acacias, principally by *Acacia Senegal*,[9] *Acacia Arabica*,[10] *Acacia stenocarpa*,[11] *Acacia Seyal*,[12] *Acacia horrida*,[13] and the Australian *A. pycnantha*.[14] Catechu or cutch,[15] an astringent medicine, is obtained from the wood of the Indian *Acacia Catechu*[16] and of *Acacia Suma*.[17] Acacia yields hard heavy and durable wood, and some of the Australian species are large and valuable timber-trees.[18] Many Acacias bear beautiful graceful foliage and handsome fragrant flowers, and several Australian species are now cultivated in the gardens of all semitropical countries and in northern conservatories.[19]

The genus was established by Tournefort[20] and was afterwards adopted by Adanson. The generic name, from ἀκαχία, relates to the spines with which the branches are usually armed.

[1] Gray, *Bot. Wilkes Explor. Exped.* i. 480. — Seemann, *Fl. Vit.* 73. — Hillebrand, *Fl. Haw. Is.* 112.

[2] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 391.

[3] Grisebach, *Fl. Brit. W. Ind.* 220.

[4] Hemsley, *Bot. Biol. Am. Cent.* i. 352.

[5] Brewer & Watson, *Bot. Cal.* i. 163. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 90 (*Man. Pl. W. Texas*).

[6] Of the five great series in which Bentham arranged the species of Acacia, the *Phyllodineæ*, with leaves reduced to simple phyllodia, are almost exclusively confined to Australia, where Acacia is represented by a larger number of species than any other genus of flowering plants. The other series with bipinnate leaves are cosmopolitan in the warmer parts of the world, especially in the tropics.

[7] Maiden, *Useful Native Plants of Australia*, 302.

[8] Fluckiger & Hanbury, *Pharmacographia*, 206.

[9] Willdenow, *Spec.* iv. 1077. — Oliver, *Fl. Trop. Afr.* ii. 340. — Bentham, *Trans. Linn. Soc.* xxx. 516 (*Rev. Mim.*).

[10] Willdenow, *l. c.* 1058. — Oliver, *l. c.* 350. — Bentham, *l. c.* 506. — Hooker f. *Fl. Brit. Ind.* ii. 293.

This tree, which is one of the most valuable of the genus, is widely distributed in all the Upper Nile region, and extends through Afghanistan to the Indian peninsula, where it has also been largely cultivated and naturalized except in the humid coast regions. The gum, which exudes in large quantities from wounds made in the bark, is used in India for native medicines, and by dyers and cloth-printers, and is largely exported. The wood is tough and durable, and is much employed in the manufacture of agricultural implements, for the hubs and fellies of wheels, and in boat-building. The bark is used for tanning and dyeing, and in India domestic animals are fed on the shoots and the unripe pods. Lakh is produced in some Indian provinces in large quantities from the small dried branches. (Brandis, *Forest Fl. Brit. Ind.* 181.)

[11] Richard, *Fl. Abyss.* i. 238. — Oliver, *l. c.* 351. — Bentham, *l. c.* 512.

[12] Delile, *Fl. d'Égypte*, 142, t. 52, f. 2. — Oliver, *l. c.* 351. — Bentham, *l. c.* 512.

[13] Willdenow, *l. c.* 1082. — Harvey & Sonder, *Fl. Cap.* ii. 281. — Bentham, *l. c.* 507.

[14] Bentham, *Hooker Lond. Jour. Bot.* i. 351; *Fl. Austral.* ii. 365; *Trans. Linn. Soc.* xxx. 469.

[15] Fluckiger & Hanbury, *l. c.* 213.

[16] Willdenow, *l. c.* 1079. — Bentham, *Trans. Linn. Soc.* xxx. 519. — Hooker f. *l. c.* 295.

The wood of *Acacia Catechu* is exceedingly durable, and is not attacked by white ants or injured by the Teredo. In India it is thought to yield the best charcoal, and in some parts of the country is largely used in the manufacture of agricultural implements, while in Burmah it is said to be preferred to all other woods for house-posts. The bark is astringent and bitter, and is sometimes employed in tanning. The most valuable product of this tree, however, is catechu. In order to prepare this the heartwood is cut into chips which are boiled in water many times changed until it is reduced to a thick black paste, which when dry is the cutch of commerce. This is consumed in the East with the betel-leaf, is exported to Europe for dyeing and tanning, and is also used medicinally. (Brandis, *l. c.* 187.)

[17] Brandis, *l. c.* 187. — Bentham, *l. c.* 519.

[18] Maiden, *l. c.* 349.

Acacia Melanoxylon (Aiton, *Hort. Kew.* ed. 2, v. 462. — Bentham, *Fl. Austral.* ii. 388; *Trans. Linn. Soc.* xxx. 481), the Australian Black-wood, a large tree of extratropical and semitropical eastern Australia, is perhaps the most valuable of the genus as a timber-tree, producing hard and close-grained very dark-colored durable wood capable of receiving a fine polish. It is much used in cabinet-making, in boat-building, for gun-stocks, picture-frames, pianofortes, and oil-casks, and in all sorts of construction. *Acacia Melanoxylon* has been extensively cultivated in Madras and other parts of India, although it has not maintained its Australian reputation there as a timber-tree. (Maiden, *l. c.*)

[19] Nicholson, *Dict. Gard.* — Naudin, *Manuel de l'Acclimateur*, 107.

[20] Tournefort, *Inst.* 605, t. 375.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Flowers in globose heads, the peduncles bibracteolate at the apex; legume thick, pulpy, indehiscent	1. A. Farnesiana.
Flowers in elongated slender spikes; legume compressed, straight or contracted between the seeds; branches armed with stout recurved infrastipular spines.	
Legume broad, straight or slightly contracted between the seeds; seeds narrowly obovate or ovate	2. A. Wrightii.
Legume narrow, often conspicuously contracted between the seeds; seeds nearly orbicular	3. A. Greggii.

ACACIA FARNESIANA.

Huisache. Cassie.

Flowers in globose heads on clustered peduncles bibracteolate at the apex. Legume thick, pulpy, indehiscent. Branchlets armed with persistent spinescent stipules.

Acacia Farnesiana, Willdenow, *Spec.* iv. 1083. — Nuttall, *Gen.* ii. 80. — De Candolle, *Prodr.* ii. 461. — Don, *Gen. Syst.* ii. 414. — Spach, *Hist. Vég.* i. 80. — Hooker, *Compan. Bot. Mag.* i. 24. — Bentham, *Hooker Lond. Jour. Bot.* i. 494; *Trans. Linn. Soc.* xxx. 502 (*Rev. Mim.*). — Dietrich, *Syn.* v. 494. — Engelmann & Gray, *Jour. Bost. Soc. Nat. Hist.* v. 216, 239 (*Pl. Lindheim.* i.). — Seemann, *Bot. Voy. Herald*, 282. — Gray, *Smithsonian Contrib.* iii. 67 (*Pl. Wright.* i.); *Proc. Am. Acad.* v. 158. — Torrey, *Bot. Mex. Bound. Surv.* 62. — Chapman, *Fl.* ed. 2, Suppl. 619. — Sargent, *Garden and Forest*, ii. 400. — Coulter, *Contrib. U. S. Nat. Herb.* 99 (*Man. Pl. W. Texas*).

Mimosa Farnesiana, Linnæus, *Spec.* 521. — Lamarck, *Dict.* i. 18. — *Nouveau Duhamel*, ii. 92, t. 28.

Mimosa scorpioides, Forskål, *Fl. Ægypt.-Arab.* lxxvii.

A. pedunculata, Willdenow, *Spec.* iv. 1084.

A. edulis, Willdenow, *Enum.* 1056.

Mimosa pedunculata, Poiret, *Lam. Dict.* Suppl. i. 81.

Vachellia Farnesiana, Wight, *Cat.* No. 591; *Icon. Pl. Ind. Orient.* t. 300. — Wight & Arnott, *Prodr. Fl. Ind.* 272.

Farnesia odora, Gasparini, *Descr. Nuov. Gen. Leg.* t.

A.? leptophylla, De Candolle, *Cat. Hort. Monsp.* 74; *Prodr.* ii. 472.

A. Farnesiana, var. **pedunculata**, Don, *Gen. Syst.* ii. 414.

A. lenticellata, F. Mueller, *Jour. Linn. Soc.* iii. 147.

A tree, twenty or thirty feet in height, with a straight trunk twelve or eighteen inches in diameter, separating, six or eight feet from the ground, into many long pendulous graceful branches which form a round wide-spreading head. The bark of the trunk, which is thin and reddish brown, is irregularly broken by long reticulated ridges, and exfoliates in large thin scales. The branchlets are slender, terete, or slightly striately angled, glabrous or at first puberulous, and armed with straight rigid terete spines developed from the persistent stipules and sometimes an inch and a half long, often much smaller or minute. The leaves are alternate on the young branchlets and are fascicled in earlier axils; they are short-petiolate with from two to eight but usually four or five pairs of pinnæ, three or four inches in length, and generally somewhat puberulous on the petioles and rachises, and in Texas mostly fall at the beginning of winter; the pinnæ are sessile or short-stalked, remote or close together, and from twenty to fifty-foliolate. The leaflets are linear, acute, tipped with minute points, unequal at the base, sessile or short-petiolulate, glabrous or puberulous, and bright green on both surfaces. The peduncles are axillary, solitary, or most often two or three together; they are rather slender, puberulous, from an inch to an inch and a half long, and furnished with two minute dentate connate bracts which form an involucral cup immediately under the flower-heads. These are covered with hoary pubescence before the flowers open, and at maturity are two thirds of an inch in diameter. The flowers are bright yellow, very fragrant, a sixteenth of an inch in length, and are produced during the summer and autumn from the axils of minute clavate pilose bractlets. The calyx is about half as long as the petals, and like them somewhat pilose on the outer surface. The stamens are two or three times as long as the corolla. The ovary is shortly stipitate and covered with long pale hairs. The legumes are indehiscent, oblong, cylindrical or spindle-shaped, thick, turgid, straight or curved, slightly constricted between the seeds, short-stalked, and contracted at the apex into short thick points; they are two or three inches long, one half to two thirds of an inch broad, dark red-purple, lustrous, and marked by broad light-colored bands along the two sutures which are defined by elevated grooved lines. The outer coat of the walls is thin and papery, and incloses a thick pithy pulp-like substance which surrounds the seeds, each in a

separate thin-walled compartment. The seeds are suspended transversely in two ranks on short straight funicles; they are a quarter of an inch long, ovate, thick, and flattened on the inner surface by mutual pressure; the testa is crustaceous, and consists of a thin outer and of a thicker harder and paler inner coat; it is light brown and lustrous on the outer surface, which is faintly marked on both sides of the seed by large oval rings. The embryo is pale yellow, with thick cotyledons, and has a straight slightly exserted radicle.

Acacia Farnesiana is now widely distributed through the tropical and subtropical regions of the two worlds; it has, however, been so long cultivated and has established itself so completely in many countries that it is not possible to determine accurately where it is really indigenous. It is probably a native of America from the valley of the Rio Grande to northern Chile;[1] it is abundant and probably indigenous in northern central and in the interior of northeastern Australia;[2] it is abundant, too, and possibly indigenous in south-tropical Africa,[3] and has become entirely naturalized in the West Indies,[4] in Guiana, Brazil,[5] and in some parts of the Argentine Republic, in northern[6] and northern-tropical Africa,[7] India,[8] southern China,[9] the Indian Archipelago,[10] and the islands of the Pacific Ocean.[11] Along the southern borders of the United States *Acacia Farnesiana* is established in the neighborhood of towns from the shores of the Gulf of Mexico[12] to southern California,[13] and in the arid and almost uninhabited region between the Nueces and the Rio Grande it grows in places so remote from human habitations and apparently so little altered through the agency of man that it is not easy to believe that it is not indigenous there. In southern Florida on the shores of the Gulf of Mexico, and in the neighborhood of New Orleans, *Acacia Farnesiana* has also sparingly established itself as an escape from gardens.

The wood of *Acacia Farnesiana* is hard, heavy, and close-grained; it contains many evenly distributed open ducts, the layers of annual growth being barely distinguishable, and many thin conspicuous medullary rays, and is a rich reddish brown, with thin pale sapwood. The specific gravity of the absolutely dry wood is 0.8304, a cubic foot weighing 51.74 pounds.[14] In India it is used for the knees of small vessels and in the manufacture of agricultural implements;[15] and a gum of commercial value is collected from the trunk.[16] A decoction of the pods, which contain a large amount of tannin, is used in Mexico in making ink.[17]

Acacia Farnesiana is cultivated on a large scale in southern Europe, especially in France and northern Italy, for its fragrant flowers which are used in the manufacture of perfumery;[18] it is planted for ornament in the gardens of all warm countries, and in India is employed as a hedge plant.

[1] A. de Candolle, *Géographie Botanique*, ii. 770. — Bentham, *Trans. Linn. Soc.* xxx. 502 (*Rev. Mim.*).

[2] Bentham, *Fl. Austral.* ii. 419.

[3] Bentham, *Trans. Linn. Soc. l. c.*

[4] Grisebach, *Fl. Brit. W. Ind.* 222. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 49.

[5] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 391.

[6] Hooker, *Niger Fl.* 331. — Oliver, *Fl. Trop. Afr.* ii. 346.

[7] Ball, *Jour. Linn. Soc.* xvi. 442.

[8] Wight & Arnott, *Prodr. Fl. Ind.* 272 (Vachellia). — Beddome, *Fl. Syle. S. Ind.* i. t. 52. — Hooker f. *Fl. Brit. Ind.* ii. 292.

[9] Bentham, *Fl. Hongk.* 101.

[10] Miquel, *Fl. Ind. Bat.* i. pt. i. 7.

[11] Hillebrand, *Fl. Haw. Is.* 113.

[12] Hemsley, *Bot. Biol. Am. Cent.* i. 352. — Havard, *Proc. Nat. Mus.* viii. 490. — C. G. Pringle, *Garden and Forest*, ii 393.

[13] Brewer & Watson, *Bot. Cal.* i. 164.

[14] *Garden and Forest*, iii. 344.

[15] Beddome, *l. c.*

[16] Gamble, *Man. Indian Timbers*, 150.

[17] Havard, *l. c.*

[18] Grasse in southern France is the centre of Cassie culture in Europe. A sandy soil and the warm slopes of hills open to the sun and protected from cold north winds are preferred for the plantations, which are often of great extent. On limestone soil the Cassie also flourishes and grows to a larger size than on granite, but it blossoms later, and flowers which open late in the season are less fragrant than earlier ones.

The seed is sown in March and April in carefully prepared beds exposed to the south and frequently watered to hasten germination and the growth of the young plants. These are transplanted the following year to the ground where they are to stand permanently, and are usually set six feet apart each way in order to secure a sufficient development of the branches and permit the cultivation of the soil between the plants. The plantations are kept free from weeds, and the ground is usually thoroughly cultivated every spring and enriched with a good coating of manure. The main stems of the young plants are generally stopped at a height of two feet from the ground to force the development of several main branches,

Acacia Farnesiana appears to have been first cultivated in Europe in the gardens of Cardinal Odoardo Farnese[1] in Rome, whither it was brought in 1611 from San Domingo; and the earliest description with an excellent figure was published in 1625 by Pietro Castelli in a work[2] devoted to an account of the rare plants in the Farnese gardens.[3]

so that the flowers, which are gathered by women and children, may not grow too far above the ground. The branches are cut every year in such a manner as to give the plants a vase-like form, which has been found best suited to insure the production of the largest quantity of flowers near the ground. The flowers are produced from the middle of summer until the middle of autumn, and a few blossoms continue to appear until frost. The earliest, however, those which open during hot weather, are considered more valuable than those which open late in the season, and every effort is made to advance the flowering period. The flowers are gathered in the morning and are at once delivered to manufacturers.

A variety known as *Acacia Farnesiana sempervirens*, which appeared a few years ago in the gardens of southern Europe, is now cultivated. It is thought to be more valuable than the ordinary form, as it produces two crops of flowers in a year, one in the spring and the other at the end of summer. It is also a larger, more robust, hardier, and more productive plant than the type. The essence of cassie is used in the preparation of pomades, perfumed oils, and extracts. The flowers are not distilled, the only process used to extract the perfume being that known as *enfleurage*. This consists in spreading the flowers over glass plates covered with a thin layer of pure grease. The grease is turned over two or three times a week until it is impregnated with the perfume, usually at the end of twenty-five or thirty days. The impregnated grease is then distilled to obtain the pure essence. The process of *enfleurage* is also performed with hot oil. Olive oil of the best quality is poured into large heated kettles containing the flowers, and is then heated almost or quite to the boiling point, while workmen keep turning the flowers with large wooden spoons to prevent them from falling to the bottom of the kettle and burning. When this operation has been continued long enough, the flowers and oil are poured into little sacks which are then pressed under an hydraulic press. (See Naudin, *Garden and Forest*, iv. 309. — Eugene Rimmel, *The Book of Perfumes*, 228, 251. — *The Art of Perfumery*, by G. W. Septimus Piesse, 26, 199.)

[1] Odoardo Farnese (1573–1626) was distinguished for the sanctity of his life, and for his wealth and the magnificence of his palaces and gardens. (See Litta, *Famiglie Celebri di Italia.*)

[2] *Exactissima Descriptio Rariorum Quarundam Plantarum, quæ continentur Romæ in Horto Farnesiano.*

[3] *Acacia Indica Farnesiana*, 3. t. — Ray, *Hist. Pl.* i. 977.

Acacia Indica foliis Scorpioidis leguminosæ siliquis fuscis teretibus resinosis, Hermann, *Cat. Hort. Lugd. Bat.* 5. — Miller, *Dict.* No. 4.

Mimosa spinis geminis distinctis, foliis duplicato pinnatis, partialibus utrinque octo, Linnæus, *Hort. Ups.* 146.

EXPLANATION OF THE PLATE.

PLATE CXLI. ACACIA FARNESIANA.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. Vertical section of an ovary, enlarged.
5. A fruiting branch, natural size.
6. Cross section of a legume, natural size.
7. Vertical section of a portion of a legume, natural size.
8. Vertical section of a seed, enlarged.
9. An embryo, enlarged.

ACACIA FARNESIANA

ACACIA WRIGHTII.

Cat's Claw.

LEGUMES broad, straight, or somewhat contracted between the seeds; seeds narrowly obovate or ovate. Leaves glabrous or slightly pubescent.

Acacia Wrightii. Bentham; Gray, *Smithsonian Contrib.* iii. 64 (*Pl. Wright.* i.); *Trans. Linn. Soc.* xxx. 521 (*Rev. Mim.*). — Gray, *Smithsonian Contrib.* v. 53 (*Pl. Wright.* ii.). — Walpers, *Ann.* iv. 626. — Torrey, *Bot. Mex. Bound. Surv.* 61. — Watson, *Proc. Am. Acad.* xvii. 351. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 63.

A small tree, occasionally twenty-five to thirty feet in height, with a short trunk ten or twelve inches in diameter and spreading branches forming a low wide irregular head; or more frequently a shrub with many stems often only a few feet high. The bark of the trunk is an eighth of an inch thick and furrowed, the surface of the ridges separating into thin narrow scales. The branches are armed with occasional stout recurved infrastipular chestnut-brown spines a quarter of an inch long, compressed towards the broad base and very sharp-pointed, or are rarely unarmed. The branchlets when they first appear are somewhat striately angled, glabrous, and pale yellow-brown or dark red-brown, turning pale gray in their second year. The leaves are alternate on the young branchlets or fascicled in the axils of former leaves, glabrous or slightly pubescent especially on the petioles and rachises, with two to six pinnæ, and one or two inches in length. The petioles are slender, a third of an inch long, and eglandular or furnished with small convex glands; the pinnæ are four to ten-foliolate. The leaflets are obliquely obovate-oblong, obtuse, rounded and often apiculate, sessile or short-petiolulate, two or sometimes three-nerved, reticulate-veined, rigid, bright green and rather paler on the lower than on the upper surface, and from a sixteenth to a quarter of an inch long. The stipules are linear, acute, a sixteenth of an inch in length, and caducous. The flowers, which appear from the end of March to the end of May, are produced in narrow spikes an inch and a half long, often interrupted below the middle, on slender fascicled axillary pubescent or sometimes glabrous peduncles; they are borne on thin pubescent pedicels from the axils of minute caducous bractlets, and are light yellow and fragrant, with stamens a quarter of an inch in length. The calyx is obscurely five-lobed, pubescent on the outer surface, and half as long as the spatulate petals, which are slightly united at the base and ciliate on the margins. The ovary is long-stalked and clothed with long pale hairs. The legumes, which are fully grown early in the summer and fall in the autumn, are indehiscent, slightly falcate, compressed, stipitate, oblique at the base, rounded and short-pointed at the apex, two to four inches in length, an inch in breadth, with thick straight or irregularly contracted margins and thin papery walls conspicuously marked by narrow horizontal reticulated veins. The seeds, which are suspended transversely on long slender funicles, are narrowly obovate, compressed, and a quarter of an inch long; the testa is thin, cartilaginous, light brown, and marked on the two sides of the seed with a large oval depression. The embryo is compressed, with oval cotyledons and an included radicle.

Acacia Wrightii is distributed from the neighborhood of New Braunfels in the valley of the Guadaloupe River in western Texas to the Sierra Madre in Nuevo Leon. It is most common and grows to the largest size south of the Rio Grande, where it abounds on dry gravelly mesas and foothills.

The wood of *Acacia Wrightii* is very heavy, hard, and close-grained, with the layers of annual growth marked by one or two rows of small open ducts, and contains many smaller scattered open ducts and obscure medullary rays. The color is a bright clear brown streaked with red and yellow, the thin

sapwood composed of six or seven layers of annual growth being clear yellow. The specific gravity of the absolutely dry wood is 0.9392, a cubic foot weighing 58.53 pounds. It furnishes excellent fuel, and is used in large quantities for that purpose in all the territory adjacent to the lower Rio Grande.

Acacia Wrightii was discovered in the neighborhood of Matamoras by Jean Louis Berlandier in 1830. Its specific name commemorates the late Charles Wright,[1] who, several years later, found it in western Texas.

[1] See i. 94.

EXPLANATION OF THE PLATE.

PLATE CXLII. ACACIA WRIGHTII.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Portion of a stamen, enlarged.
5. A pistil, enlarged.
6. Vertical section of an ovary, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. A portion of a legume, one of the valves removed, natural size.
10. Vertical section of a seed, enlarged.
11. An embryo, enlarged.

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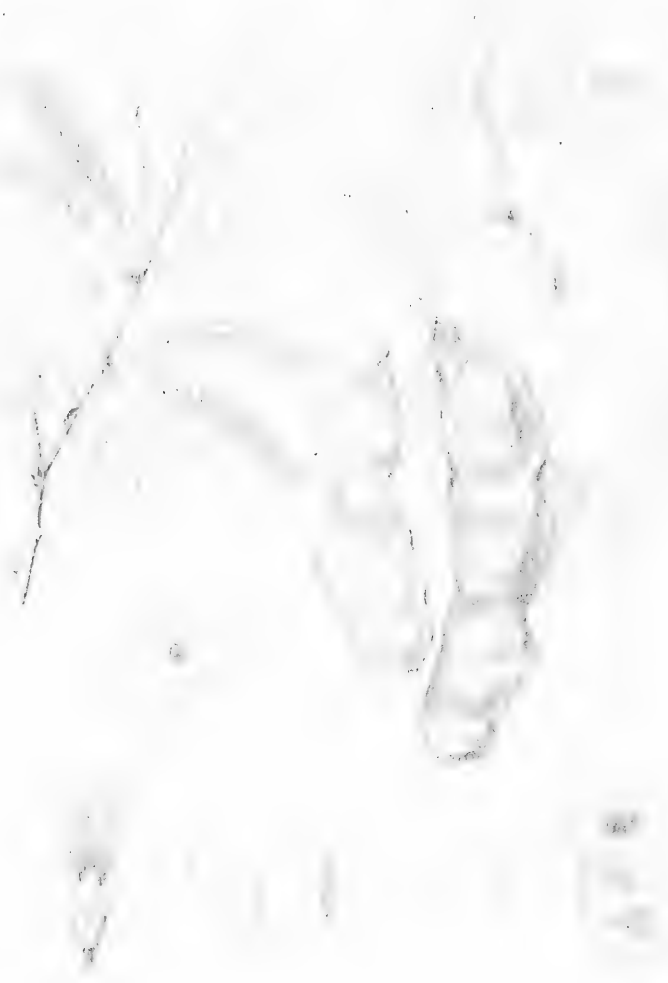

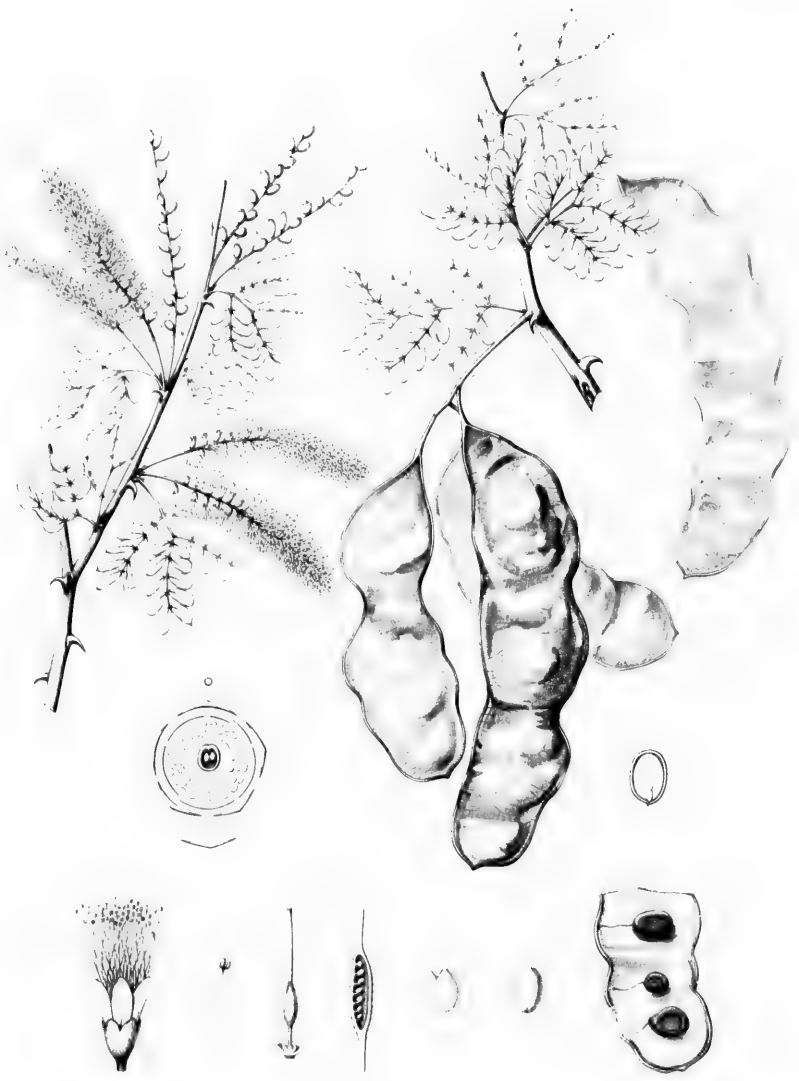

ACACIA WRIGHTII.

ACACIA GREGGII.

Cat's Claw. Uña de Gato.

LEGUMES narrow, often conspicuously contracted between the seeds; seeds nearly orbicular. Leaves hoary pubescent.

Acacia Greggii, Gray, *Smithsonian Contrib.* iii. 65; v. 53 (*Pl. Wright.* i., ii.); *Ives' Rep.* 11. — Torrey, *Sitgreaves' Rep.* 158. — Torrey, *Pacific R. R. Rep.* vii. pt. iii. 10; *Bot. Mex. Bound. Surv.* 61. — Walpers, *Ann.* iv. 625. — Bentham, *Trans. Linn. Soc.* xxx. 521 (*Rev. Mim.*). — Brewer & Watson, *Bot. Cal.* i. 164. — Rothrock, *Wheeler's Rep.* 108. — Hemsley, *Bot. Biol. Am. Cent.* i. 353.

A low many-branched tree, rarely thirty feet in height, with a trunk ten or twelve inches in diameter; or often a straggling shrub. The bark of the trunk is an eighth of an inch thick and furrowed, the surface separating into thin narrow scales. The branches are armed with stout recurved infrastipular terete spines a quarter of an inch long, and broad and flat at the base. The branchlets are striately angled, puberulous, and pale brown faintly tinged with red. The leaves are alternate on the young branchlets and fascicled in the axils of earlier leaves, pubescent or puberulous, with two to six pinnæ, one to three inches in length, persistent and petiolate, the short slender petioles being furnished near the middle with a minute oblong chestnut-brown gland; the pinnæ are eight to ten-foliolate, with oblique obovate hoary leaflets rounded or truncate at the apex, and unequally contracted at the base into short petiolules; they are two or three-nerved, reticulate-veined, from a sixteenth to a quarter of an inch long, and rather thick and rigid. The stipules are linear, acute, a sixteenth of an inch long and caducous. The flowers, which appear in succession from April to September, are produced in dense oblong pubescent spikes from the axils of minute caducous bractlets; they are fragrant, bright creamy yellow, and with their stamens nearly a quarter of an inch long. The peduncles vary from one half to two thirds of an inch in length, and are fascicled usually two or three together in the axils of the leaves towards the ends of the branches. The calyx is obscurely five-lobed, puberulous on the outer surface, and half as long as the petals, which are only slightly united at the base and are bordered with a narrow margin of pale tomentum. The ovary is long-stalked and clothed with long pale hairs. The legumes, which are fully grown in midsummer, hang unopened on the branches until winter, and sometimes until the following spring; they are narrow, compressed, straight or slightly falcate, obliquely contracted at the base into a short stalk, and acute or rounded at the apex; they are more or less contracted between the seeds, and when fully ripe are curled or often contorted; the valves are thin and membranaceous, thick-margined, light brown, and conspicuously transversely reticulate-veined. The seeds are nearly orbicular, compressed, and a quarter of an inch in diameter; the testa is thin, crustaceous, dark brown and lustrous, and marked on the two sides of the seed with a small oval depression. The embryo is thin, with a short included radicle.[1]

Acacia Greggii is distributed from the valley of the Rio Grande in western Texas through southern

[1] *Acacia Greggii* often resembles *Acacia Wrightii* so closely that it is not easy to distinguish the two trees. Bentham described the Texas plant as unarmed, and depended chiefly upon this character to separate the two species. The branches of *Acacia Wrightii*, however, are armed, and it is unusual to find them without the short recurved spines which are similar on the two species. The leaflets of *Acacia Greggii* are rather smaller than those of *Acacia Wrightii*, and the foliage is a much lighter green and more generally pubescent. The pods are narrower and more conspicuously contracted between the seeds, and when fully ripe become twisted and contorted, a peculiarity I have never seen in the pods of *Acacia Wrightii*. The seeds, however, offer the best means for distinguishing the species. In *Acacia Wrightii* they are narrowly obovate or ovate, and in *Acacia Greggii* are constantly orbicular or nearly so, and much larger.

New Mexico and Arizona to southern California, and extends southward into northern Mexico. It is a common tree in all this region, occupying dry gravelly mesas, the sides of low cañons, and the banks of mountain streams.

The wood of *Acacia Greggii* is heavy, very hard, strong, close-grained, and durable. It contains several rows of large open ducts marking the layers of annual growth, and many thin medullary rays. It is rich brown or red, with thin light yellow sapwood composed of five or six layers of annual growth. The specific gravity of the absolutely dry wood is 0.8550, a cubic foot weighing 53.28 pounds.

A resinous gum resembling gum arabic is produced in small quantities by this species.[1]

Acacia Greggii was discovered in Nuevo Leon by Jean Louis Berlandier in 1830, and in Texas by Charles Wright in 1851. It was named in honor of Dr. Josiah Gregg, author of *The Commerce of the Prairies*, who made numerous early botanical explorations in Texas, New Mexico, and northern Mexico.

[1] *Am. Jour. Pharm.* lii. 409.

EXPLANATION OF THE PLATE.

PLATE CXLIII. ACACIA GREGGII.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A fruiting branch, natural size.
5. A seed, enlarged.
6 and 7. Vertical sections of a seed, enlarged.
8. An embryo, enlarged.

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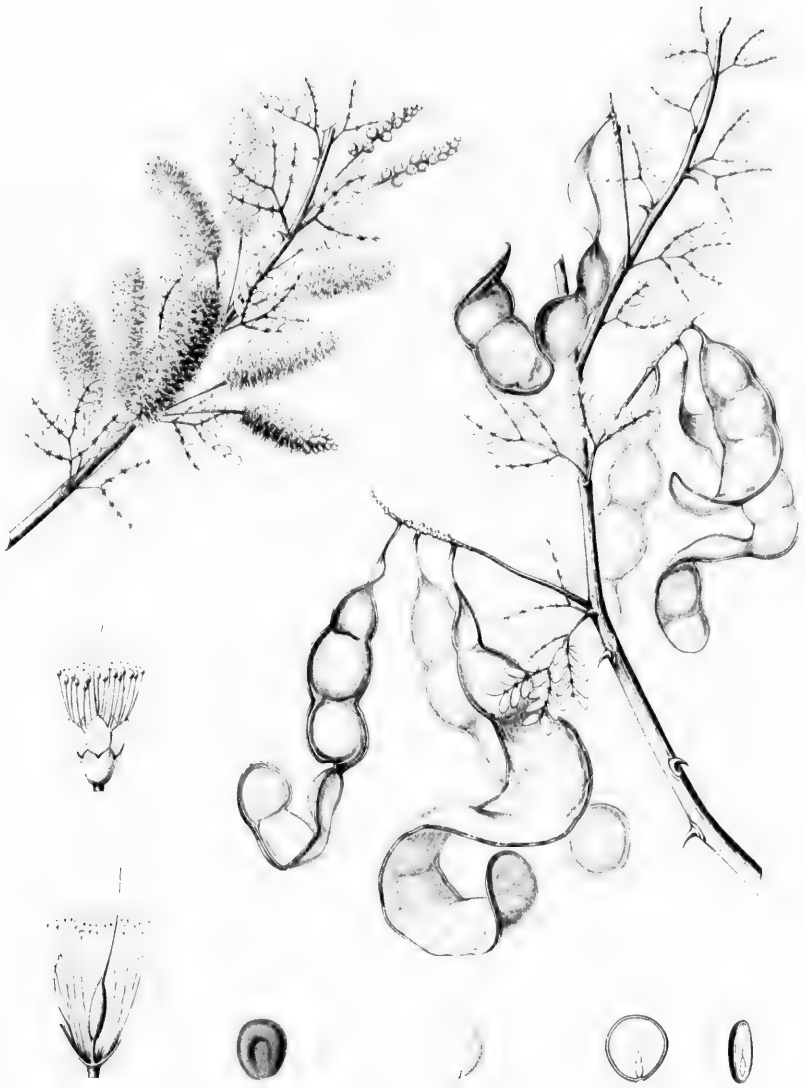

ACACIA [illegible]

LYSILOMA.

Flowers perfect or polygamous, in globose heads or cylindrical spikes; calyx 5-toothed, the teeth valvate in æstivation; petals 5, valvate in æstivation; stamens indefinite, united at the base; ovary many-ovuled. Legume tardily dehiscent by the separation of the valves from the persistent margins. Leaves abruptly bipinnate.

Lysiloma, Bentham, *Hooker Lond. Jour. Bot.* iii. 82. — Bentham & Hooker, *Gen.* i. 595. — Baillon, *Hist. Pl.* ii. 70.

Trees or shrubs, with slender unarmed branches. Leaves bipinnate, long-petiolate, the petiole often marked by a large conspicuous gland; leaflets small, in many pairs, or sometimes large, in few pairs; stipules large, membranaceous, persistent, or deciduous. Flowers perfect or rarely polygamous, numerous, minute, usually white or greenish white, produced from the axils of minute bractlets more or less dilated at the apex, and collected into globose heads or cylindrical spikes. Peduncles axillary, solitary, or fascicled, or occasionally shortly racemose, and then developed from the axil of a deciduous bract, and furnished near the middle with a minute bractlet. Calyx campanulate, dentate. Corolla funnel-shaped, the petals united for more than half their length. Stamens indefinite, generally twelve to thirty, exserted; filaments filiform, united at the base into a column free from the corolla; anthers minute, ovate, attached on the back, versatile, two-celled, the cells opening longitudinally. Ovary free in the bottom of the calyx, sessile or shortly stipitate, many-ovuled, contracted into a slender subulate style; stigma terminal, minute; ovules suspended in two ranks from the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume linear or broad, straight or falcate, compressed, submembranaceous, the valves at maturity separating from the undivided margins or rarely dehiscent on the inner margin, continuous within; exocarp thin and papery, dark-colored; endocarp rather thicker, pale yellow. Seed ovate, compressed, destitute of albumen, transverse, suspended by a long slender funicle, the hilum near the base; testa thin, crustaceous. Embryo filling the cavity of the seed; cotyledons oval, flat; the radicle straight, slightly exserted.

Ten species[1] of Lysiloma, inhabitants of the West Indies, Mexico, Lower California,[2] Central America,[3] and Bolivia,[4] are distinguished. *Lysiloma latisiliqua*, a tree widely distributed through the Antilles, reaches the coast of southern Florida. Some of the species produce valuable timber, especially *Lysiloma Sabicu*,[5] a large tree of Cuba and the bahama Islands.

The genus was established by Bentham to receive a number of plants previously referred to Acacia,

[1] Bentham, *Trans. Linn. Soc.* xxx. 533 (*Rev. Mim.*).

[2] Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 153 (*Pl. Baja Cal.*). — Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 69.

[3] Hemsley, *Bot. Biol. Am. Cent.* i. 356.

[4] *Lysiloma polyphylla*, Bentham, *l. c.* 535.

Acacia polyphylla, C. Gay, *Fl. Chil.* ii. 254.

[5] Bentham, *Hooker Jour. Bot. & Kew Gard. Misc.* vi. 236; *Trans. Linn. Soc. l. c.* 534.

Acacia formosa, Richard, *Fl. Cub.* ii. 205 (not Kunth).

Leucæna formosa, Grisebach, *Cat. Pl. Cub.* 82.

Sabicú or savicú, as the wood of this tree is called in Cuba and in commerce, is one of the most valuable of all tropical timbers. It is hard, heavy, strong, and close-grained, with only a thin layer of sapwood. The fibre, which is often twisted or curled, gives a wavy or figured appearance to the dark chestnut-colored surface, and has sometimes caused sabicú to be mistaken for rosewood. It seasons slowly without shrinking or splitting, and is very solid, although sometimes injured by cross fractures of the fibre in the interior of the logs. It is little affected by exposure to the weather, even when unprotected by paint or varnish. Sabicú was once largely employed in shipbuilding for beams, keelsons, stern-posts, pillars, and cleats; and is now much used, especially in England, by cabinet-makers, and for the treads of stairs. In the Bahamas, where *Lysiloma Sabicu* does not grow to so large a size as it does in Cuba, it is called Horseflesh Mahogany, and the wood is used in the islands in construction and for shipbuilding, and is exported to England in small quantities. (*Treasury of Botany*, ii. 704. — Laslett, *Timber and Timber-trees*, 164. — *Kew Bull.* i. No. 12, 4, t. — Jackson, *Commercial Botany of the 19th Century*, 154.)

from which they differ in their smaller number of stamens united at the base into a tube free from the corolla, and in their legumes which, like those of Entada and Mimosa, mostly open by the separation of the thin walls from the persistent thickened margins.

The generic name, from λύσις and λῶμα, refers to the separation of the valves from the margins of the legume.

LYSILOMA LATISILIQUA.

Wild Tamarind.

LEAVES with 2 to 4 pairs of pinnæ; leaflets in 10 to 20 pairs, obliquely ovate or oblong.

Lysiloma latisiliqua, Bentham, *Trans. Linn. Soc.* xxx. 534 (*Rev. Mim.*) — Chapman, *Fl.* ed. 2, Suppl. 619. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 64.

Mimosa latisiliqua, Linnæus, *Spec.* 519. — Lamarck, *Dict.* i. 11. — Persoon, *Syn.* ii. 265.

Acacia latisiliqua, Willdenow, *Spec.* iv. 1067. — De Candolle, *Prodr.* ii. 467. — Macfadyen, *Fl. Jam.* 318. — Maycock, *Fl. Barb.* 403. — Don, *Gen. Syst.* ii. 418. — Nuttall, *Sylva*, ii. 34, t. 53.

L. Bahamensis, Bentham, *Hooker Lond. Jour. Bot.* iii. 82. — Dietrich, *Syn.* v. 506.

Acacia Bahamensis, Grisebach, *Fl. Brit. W. Ind.* 221.

A tree, forty or fifty feet in height, with a trunk two or three feet in diameter and stout spreading branches which form a wide flat head. The bark of the trunk varies from a quarter to half of an inch in thickness; it is dark brown, and separates into large plate-like scales, or, on the trunks of young vigorous trees and on the branches, is smooth and light gray tinged with pink. The branchlets are glabrous or somewhat pilose, conspicuously verrucose, and, like the leaf-stalks, bright red-brown when they first appear, becoming pale or light reddish brown in their second year. The leaves are four or five inches long, glabrous or sometimes slightly puberulous, and are borne on slender petioles an inch in length, marked near the middle with a conspicuous elevated gland. The stipules are foliaceous, half an inch long, ovate, acute, auricled and semicordate at the base, usually caducous but sometimes persistent until after the opening of the flowers. The pinnæ are short-stalked and twenty to forty-foliolate, with petioles enlarged and slightly glandular at the base. The leaflets are obliquely ovate or oblong, obtuse or acute, more or less unequal at the base by the greater development of one of the sides, sessile or shortly petiolulate, entire, reticulate-veined, light green, and paler on the lower than on the upper surface. The peduncles are from three quarters of an inch to an inch and a half long and are solitary or fascicled in the axils of the upper leaves, or are arranged in short terminal racemes; their bracts and bractlets are acute, membranaceous, and caducous, the former a third of an inch and the latter about a twelfth of an inch in length. The flower-heads, which in Florida appear early in April, are covered before the flowers open with thick pale tomentum, and after the exsertion of the stamens are two thirds of an inch in diameter. The calyx is broadly five-toothed, pilose on the outer surface especially above the middle, a twelfth of an inch long or half as long as the petals, which are united for two thirds of their length and reflexed at the apex. There are about twenty stamens, which are at least twice as long as the petals and are united for a quarter of their length into a slender tube. The legumes ripen in the autumn and remain on the branches until after the flowering period of the following year; they are four or five inches long, an inch broad, acute at the apex, and borne on stems an inch or two in length two or three together from a common peduncle abruptly and conspicuously enlarged at the apex. The valves are thin and papery, bronzy green when fully grown, and ultimately dark red-brown; they separate slowly from the margins, and probably not until after the pods have lain for some time on the ground, the exocarp first gradually breaking away from the endocarp. The seeds are half an inch long, oval or obovate, and compressed, with a thin lustrous dark brown coat.

Lysiloma latisiliqua grows in Florida on Key Largo, Elliott's, Plantation, and Boca Chica Keys, although it is not common on any of these islands. It inhabits the Bahamas and many of the West India Islands and perhaps Venezuela.[1]

[1] Bentham, *Trans. Linn. Soc.* xxx. 534 (*Rev. Mim.*)

The wood of *Lysiloma latisiliqua* is heavy, hard although not very strong, tough and close-grained. It has a smooth surface susceptible of receiving a fine polish, and contains many scattered small open ducts and numerous inconspicuous medullary rays. It is rich dark brown tinged with red, with nearly white sapwood an inch to an inch and a half in thickness, and composed of four or five thick layers of annual growth. The specific gravity of the absolutely dry wood is 0.6418, a cubic foot weighing 40.00 pounds. It is occasionally used and much esteemed in Florida in boat and ship building.

Lysiloma latisiliqua was discovered in the Antilles by Plumier, and was first described in Burmann's edition of his work on American plants.[1] It was first found in Florida by Dr. J. L. Blodgett[2] on the island of Key West, from which it has now entirely disappeared.

[1] *Acacia non spinosa, siliquis latis compressis, flore albo*, 3, t. 6. *Acacia non spinosa, flore albo, foliorum pinnis latiusculis glabris, siliquis longis planis*, Miller, *Dict.* ed. 7, No. 11.

[2] See i. 33.

EXPLANATION OF THE PLATE.

PLATE CXLIV. LYSILOMA LATISILIQUA.

1. A flowering and fruiting branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A flower, the calyx and corolla removed, enlarged.
5. Portion of a stamen, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A portion of a legume, one of the valves removed, natural size.
10. Vertical section of a seed, enlarged.
11. An embryo, enlarged.

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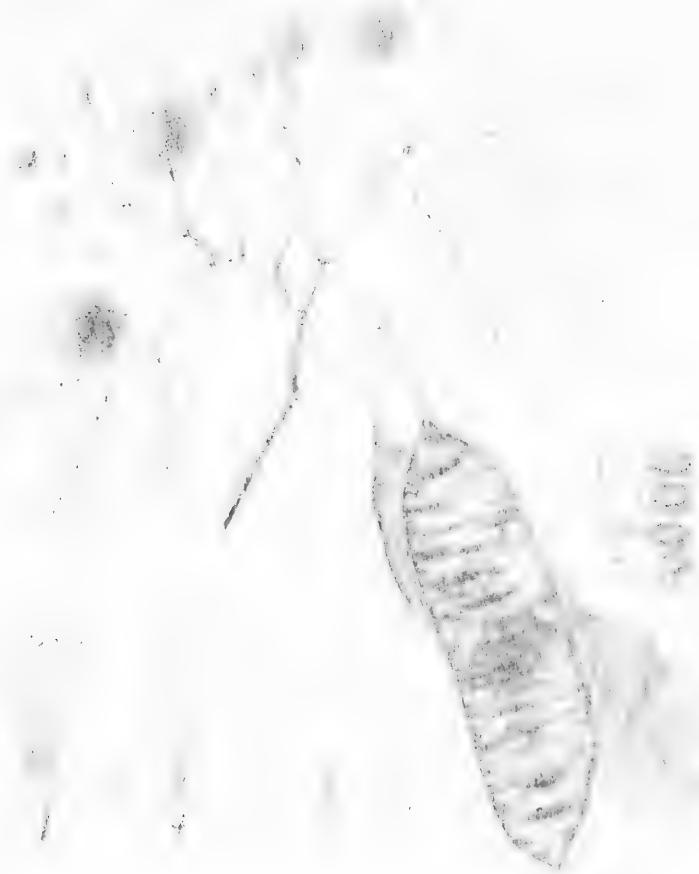

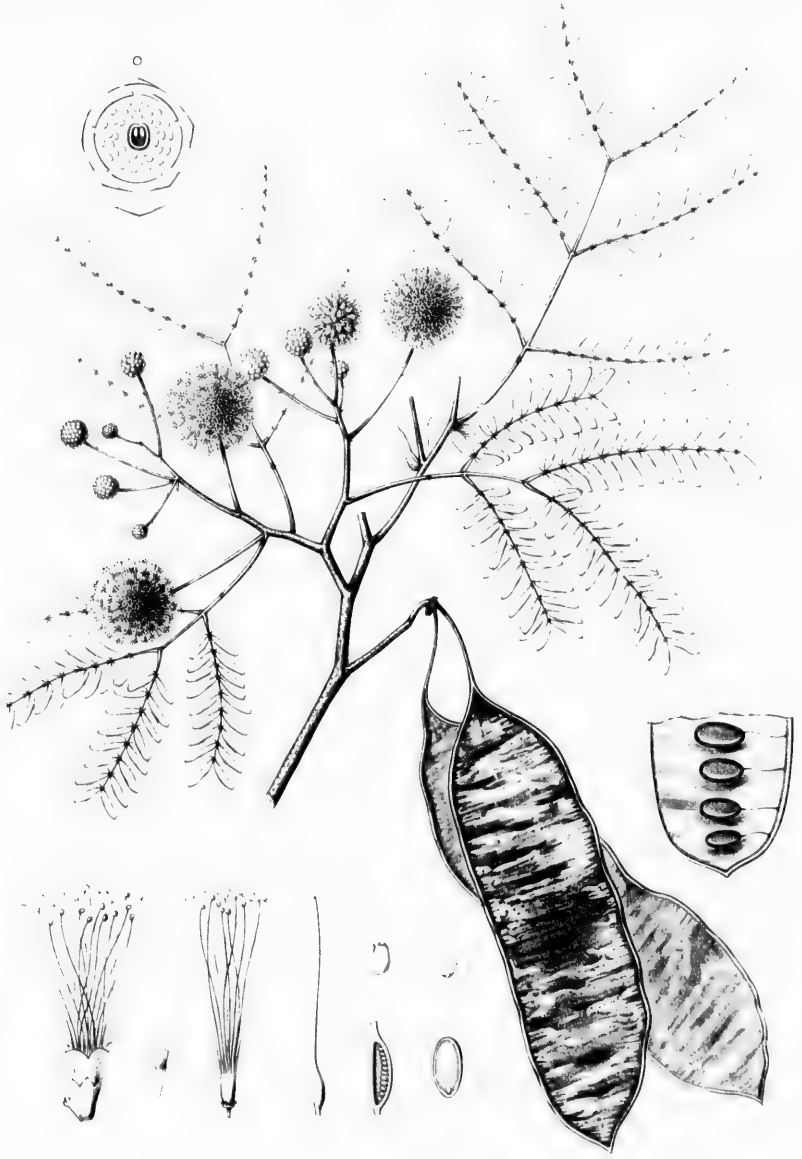

LYSILOMA LATISILIQUA

PITHECOLOBIUM.

Flowers perfect or rarely polygamous, in globose heads or in oblong or cylindrical spikes; calyx campanulate or tubular, 5 or occasionally 6-toothed, the teeth valvate in æstivation; petals as many as the teeth of the calyx, valvate in æstivation; stamens indefinite, united into a tube at the base; ovary many-ovuled. Legume 2-valved, the valves after opening variously contorted, or rarely indehiscent or articulate. Leaves bipinnate, usually glandular.

Pithecolobium, Martius, *Cat. Hort. Monac.* 188; *Herb. Fl. Brasil.* 114. — Meisner, *Gen.* pt. ii. 353. — Bentham & Hooker, *Gen.* i. 597. — Baillon, *Hist. Pl.* ii. 70.

Cathormion, Hasskarl, *Retzia*, i. 231.

Trees or shrubs, with slender branches unarmed or armed with spinescent stipules or axillary spines. Leaves alternate, petiolate, bipinnate; pinnæ many-foliolate with small leaflets, or few-foliolate with ample leaflets, or rarely three, two, or one-jugate, or unifoliolate; rachis generally marked by numerous glands between the pinnæ, and between the leaflets; stipules minute or inconspicuous, sometimes persistent, rigid or spinescent; leaflets usually penni-veined, occasionally many-nerved. Flowers perfect or sometimes polygamous, generally white, small or seldom large, produced from the axils of minute bractlets in pedunculate globose heads or in oblong cylindrical spikes. Peduncles from the axils of small deciduous bracts, solitary, fascicled or superposed, axillary or racemose or panicled at the end of the branches. Calyx campanulate or tubular, short-toothed. Corolla tubular or funnel-shaped, the petals united for more than half their length, hypogynous. Stamens many or indefinite, exserted, short or elongated, white or rose-color; filaments filiform, united at the base into a tube free from the corolla and almost as long; anthers minute, attached on the back, versatile, introrse, two-celled, the cells opening longitudinally. Ovary free in the bottom of the calyx, sessile or stipitate, many-ovuled, contracted into a slender filiform style; stigma terminal, minute or capitate; ovules suspended in two rows from the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume compressed, flat or occasionally subterete, before opening circinate, falcate or occasionally almost straight, coriaceous, solid or fleshy, rarely submembranaceous, two-valved, the valves, after opening, variously contorted, not elastically revolute, usually red on the inner surface, or indehiscent or sometimes breaking into indehiscent joints. Seed often surrounded by thin pulp, ovate or orbicular, compressed, suspended transversely, destitute of albumen; funicle filiform or variously expanded into a fleshy aril, the hilum near the base of the seed; testa thin, cartilaginous, sometimes marked on the two surfaces of the seed with a faint oval or horseshoe-shaped depression or opaque ring. Embryo filling the cavity of the seed; cotyledons flat, oval or orbicular, radicle straight, included or slightly exserted.

Pithecolobium is widely spread through the tropical and subtropical regions of the two worlds, especially in the tropics of America,[1] where more than half the species are found, and of Asia;[2] it is represented in tropical Africa[3] by a single species, and in Australia[4] by two or perhaps three species. About one hundred and twelve species are now recognized.[5] Four extend to the southern borders of

[1] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 428. — Grisebach, *Fl. Brit. W. Ind.* 226. — Hemsley, *Bot. Biol. Am. Cent.* i. 359.

[2] Thwaites, *Enum. Pl. Zeylan.* 100. — Bentham, *Fl. Hongk.* 102. — Brandis, *Forest Fl. Brit. Ind.* 173. — Hooker f. *Fl. Brit. Ind.* ii. 302. — Oliver, *Hooker Icon.* xvi. t. 1510; xx. t. 1976.

[3] Oliver, *Fl. Trop. Afr.* ii. 363.

[4] Bentham, *Fl. Austral.* ii. 423.

[5] Bentham, *Trans. Linn. Soc.* xxx. 570 (*Rev. Mim.*).

the United States; one of these, *Pithecolobium Guadalupense*,[1] is a tall stout shrub of the Florida keys; the others are small trees.

Several species of Pithecolobium produce hard and valuable timber. The pods of *Pithecolobium dulce*,[2] a native of the tropical regions of southern Mexico, contain a sweet pulp which is cooked and eaten. This tree was early introduced by the Spaniards into the Philippine Islands and then into India, where it is now largely cultivated along the railroad lines, and as a hedge plant. It is also grown in coppice for fuel, and the fruit, known in India as Manilla tamarinds, is cooked and eaten; and oil is pressed from the seeds.[3] *P. Saman*,[4] a native of America from Venezuela to Peru, is now planted in most tropical countries as a shade tree, for which purpose its handsome foliage and rapid growth make it valuable,[5] and its edible pods are used as fodder. The bark of the West Indian and Floridian *P. Unguis-cati* is astringent and tonic.

Pithecolobium differs from Inga in its bipinnate leaves. It differs in its pods from Calliandra and Albizzia, which it resembles in its flowers, and from Acacia in the union of the stamens into a tube surrounding the ovary.

The generic name, from πίθηξ and ἑλλόβιον, relates to the shape of the contorted fruit of some of the species.

[1] Chapman, *Fl.* 116.
Inga Guadalupensis, Desvaux, *Jour. Bot.* v. 70. — Nuttall, *Sylva*, ii. 40, t. 55.
P. Unguis-cati, Bentham, *Trans. Linn. Soc. l. c.* 572 in part.

[2] Bentham, *Lond. Jour. Bot.* iii. 199; *Trans. Linn. Soc. l. c.* 372. — Beddome, *Fl. Sylv. S. Ind.* i. t. 188.

[3] Brandis, *Forest Fl. Brit. Ind.* 173.

[4] Bentham, *Hooker Lond. Jour. Bot. l. c.* 216; *Martius Fl. Brasil. l. c.* 412.

[5] Gamble, *Man. Indian Timbers*, 145. — Hillebrand, *Fl. Haw. Is.* 115.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Pinnæ one or unequally two-jugate; legume curved or circinate, the valves contorted after dehiscence; seed surrounded by the enlarged ariloid funicle.
  Pinnæ one-jugate; legume subtorulose, glabrous . . . . . 1. P. UNGUIS-CATI.
Pinnæ one or many-jugate; legume flat, straight, separating into membranaceous somewhat coriaceous valves more or less interrupted within.
  Pinnæ three to five-jugate; legume shortly stipitate, the valves submembranaceous, only imperfectly divided within . . . . . 2. P. BREVIFOLIUM.
  Pinnæ two or three-jugate; legume sessile, the valves thick and woody, tardily dehiscent . . . . . 3. P. FLEXICAULE.

PITHECOLOBIUM UNGUIS-CATI.

Cat's Claw.

FLOWERS polygamous, in globose heads. Legumes subtorulose, the valves much contorted after opening. Branches armed with rigid persistent spinescent stipules.

Pithecolobium Unguis-cati, Bentham, *Hooker Lond. Jour. Bot.* iii. 200; *Trans. Linn. Soc.* xxx. 572 (*Rev. Mim.*) — Dietrich, *Syn.* v. 514. — Grisebach, *Fl. Brit. W. Ind.* 226. — Chapman, *Fl.* 116. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 49. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 64.

Mimosa Unguis-cati, Linnæus, *Spec.* 517. — Miller, *Dict.* ed. 8, No. 13. — Aublet, *Pl. Guian.* ii. 944. — Lunan, *Hort. Jam.* ii. 2. — Descourtilz, *Fl. Med. Antil.* i. 51, t. 11. — Jacquin, *Hort. Schoenb.* iii. 74, t. 392.

Inga microphylla, Willdenow, *Spec.* iv. 1004. — Maycock, *Fl. Barb.* 400.

Inga Unguis-cati, Willdenow, *Spec.* iv. 1006. — De Candolle, *Prodr.* ii. 436. — Don, *Gen. Syst.* ii. 391. — Spach, *Hist. Vég.* i. 58. — Macfadyen, *Fl. Jam.* 306. — Nuttall, *Sylva*, ii. 37, t. 54.

Mimosa rosea, Vahl, *Eclog.* iii. 33, t. 25.

Inga forfex, Kunth, *Mim.* 52, t. 16.

Inga rosea, De Candolle, *Prodr.* ii. 437.

P. forfex, Bentham, *Hooker Lond. Jour. Bot.* iii. 199. — Dietrich, *Syn.* v. 514.

P. microphyllum, Bentham, *Hooker Lond. Jour. Bot.* iii. 200. — Dietrich, *Syn.* v. 514.

A glabrous tree, sometimes twenty or twenty-five feet in height, with a slender trunk seven or eight inches in diameter and a low flat irregular head; or more often a shrub with many vine-like almost prostrate stems. The bark of the trunk is a quarter of an inch thick, reddish brown, and divided by shallow fissures into small square plates. The branchlets are slender, somewhat zigzag, at first slightly striately angled, light gray-brown or sometimes dark reddish brown, covered with minute pale lenticels and armed with straight persistent rigid stipular spines broad at the base and a quarter of an inch in length, or rarely minute. The leaves are persistent and long-petiolate, with a single pair of bifoliolate pinnæ. The petioles are slender, faintly grooved on the upper side, from half an inch to an inch long, furnished at the apex with solitary conspicuous orbicular glands and tipped with the minute spinescent rachises. The secondary petioles, which vary from a quarter to half of an inch in length and are slightly and abruptly enlarged at the base, are furnished with glands between the short stout petiolules of the leaflets; these are obtuse, orbicular or broadly oblong, very oblique, and obtuse or rarely emarginate at the apex; they are entire, membranaceous, or somewhat coriaceous, reticulate-veined, bright green and lustrous on the upper, and paler on the lower surface, and vary from half an inch to two inches in length and from half an inch to an inch and a half in breadth. The flowers, which in Florida first open in March and continue to appear until midsummer, are produced in globular heads borne on slender peduncles an inch or an inch and a half long fascicled in the axils of the leaves or collected in ample panicles at the ends of the branches; their bracts are lanceolate, acuminate, chartaceous, a quarter of an inch in length, and early deciduous. The flowers are pale yellow, glabrous or slightly puberulous, and with their fully grown purple stamens are half an inch long. The calyx is rather less than a twelfth of an inch long, broadly toothed, and a quarter of the length of the acuminate petals which barely exceed the tube formed by the union of the filaments. The ovary is glabrous, long-stalked, and in the sterile flower minute or rudimentary. The legumes are compressed, slightly torulose, stipitate, rounded or acute at the apex, two to four inches long and from a quarter to half an inch broad; the valves are reticulate-veined, thickened on the margins, bright reddish brown, and after opening greatly and variously contorted. The seeds are irregularly obovate or sometimes nearly triangular, compressed or thickened, and a third of an inch long, the lower portion being surrounded by the enlarged bright

red ariloid funicles; the testa is thin, dark chestnut-brown, lustrous, and marked on the two sides of the seed with a faint oval ring.

Pithecolobium Unguis-cati is found in Florida on the shores of Caximbas Bay and on many of the southern keys, where it is generally distributed in the original forests and in the shrubby thickets which are replacing them on many of the islands; in its arborescent form it is now most abundant on the larger of the eastern keys, and probably attains its greatest size in Florida on Elliott's Key. It is widely and generally distributed through the Antilles and extends to Venezuela and New Granada.

The wood of *Pithecolobium Unguis-cati* is very hard, heavy, and close-grained, and contains numerous inconspicuous medullary rays. It has a rich red color varying to purple, with thin clear yellow sapwood. The specific gravity of the absolutely dry wood is 0.9049, a cubic foot weighing 56.39 pounds.

The bark of *Pithecolobium Unguis-cati* is astringent and diuretic, and in Jamaica was at one time considered a sovereign cure for many diseases.[1]

The first description of *Pithecolobium Unguis-cati* appeared in the *Paradisi Batavi Prodromus*[2] of Paul Hermann, published in Amsterdam in 1689; according to Aiton,[3] it was introduced into English gardens in 1690.

[1] The bark of the Nephritic-tree, as *Pithecolobium Unguis-cati* was once called in Jamaica, was, in the last century, according to Barham, then in such general use that it was hard to find a tree that had not been stripped. It was employed in the treatment of stone, gravel, and other urinary complaints, and of diseases of the liver and spleen. (Barham, *Hort. Amer.* 111.)

[2] *Unguis-cati arbor Americana siliquosa spinosa*, 385.

Acaciæ similis spinosa, ceratoniæ foliis geminatis, floribus albis lanuginosis, siliqua compressa corniculata, seminibus nigerrimis splendentibus, Kiggelaer, *Cat. Hort. Beaum.* 3.

Acaciæ quodammodo accedens, Myrobalano chebulo Veslingii similis arbor Americana spinosa, foliis Ceratoniæ in pediculo geminatis, siliqua bivalvi, compressa, corniculata, seu cochlearum, vel arietinorum cornuum in modum incurvata; sive Unguis-cati, Breyn, *Prodr.* ed. 1739, 38.

Acaciæ quodammodo accedens, s. Ceratiæ & Acaciæ media Jamaicensis spinosa bigeminatis foliis, flosculis stamineis, atronitente fructu, siliquis parum intortis, Plukenet, *Phyt.* t. 1, f. 6.

Acacia arborea major spinosa, pinnis quatuor, majoribus, subrotundis, siliquis varie intortis, Sloane, *Cat. Pl. Jam.* 152; *Fl. Jam.* ii. 56.

Mimosa foliis bigeminatis, Linnæus, *Hort. Cliff.* 207. — Royen, *Fl. Leyd. Prodr.* 470.

Acacia quadrifolia, siliquis circinatis, Plumier, *Cat.* 17; *Pl. Am.* ed. Burmann, 2, t. 4.

The Moabite; alias the Mangrove-Beard-Tree, Griffith Hughes, *The Natural History of the Barbados*, 193.

[3] Aiton, *Hort. Kew.* iii. 439.

EXPLANATION OF THE PLATE.

PLATE CXLV. PITHECOLOBIUM UNGUIS-CATI.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower-head with all but one flower removed, enlarged.
4. A staminate flower, the corolla laid open, enlarged.
5. Vertical section of a pistillate flower, enlarged.
6. Vertical section of a staminate flower, enlarged.
7. Front and rear views of an anther, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. A seed with its aril, enlarged.
11. A seed, enlarged.
12. Vertical section of a seed, enlarged.
13. An embryo, enlarged.

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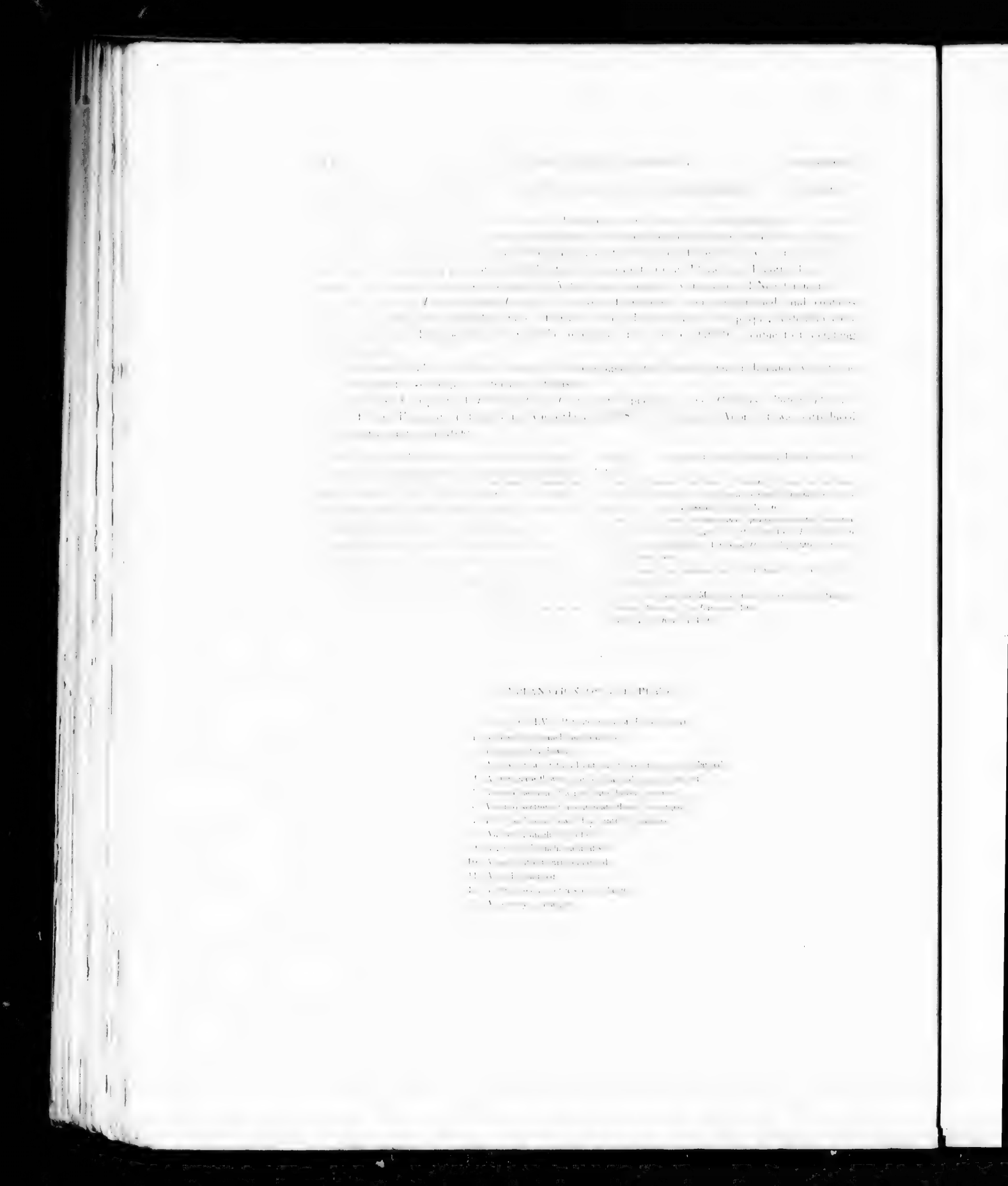
Cat. 17; *Pl. Am.*

Griffith Hughes,



PITHECOLOBIUM UNGUIS CAT.

PITHECOLOBIUM BREVIFOLIUM.

Huajillo.

FLOWERS perfect, in globose heads. Legume flat, straight, the valves not contorted after opening. Branches armed with rigid spinescent stipules.

Pithecolobium brevifolium, Bentham; Gray, *Smithsonian Contrib.* iii. 67 (*Pl. Wright.* i.); *Trans. Linn. Soc.* iii. 592 (*Rev. Mim.*). — Torrey, *Bot. Mex. Bound. Surv.* 62. — Havard, *Proc. U. S. Nat. Mus.* viii. 500. — Hemsley, *Bot. Biol. Am. Cent.* i. 359. — C. G. Pringle, *Garden and Forest*, ii. 393. — Sargent, *Garden and Forest*, ii. 400. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 101 (*Man. Pl. W. Texas*).

A tree, twenty-five or thirty feet in height, with a trunk rarely five or six inches in diameter and slender upright-growing branches which form a narrow irregular head; or more often a shrub sometimes only two or three feet in height. The bark of the trunk is smooth, light gray somewhat tinged with red, and often marked with large pale blotches. The branches are armed with stout rigid stipular spines sometimes half an inch long and persistent for many years; the branchlets are slightly striately angled and covered with minute white lenticels; when they first appear they are light gray and puberulous, and in their second year dark brown. The leaves are persistent or tardily deciduous, long-petiolate, two or three inches in length, two inches in breadth, and with eight to twelve pinnæ; when they unfold they are coated with pale tomentum, but at maturity are glabrous with the exception of a faint pubescence covering the petioles and rachises. The petioles are slender, terete, an inch long, and furnished near the middle with a dark oblong gland. The leaflets are in ten to twenty pairs and are oblong, linear, obtuse or acute at the apex, oblique at the base by the greater development of one of the sides, very short-petiolulate, from a sixth to a quarter of an inch in length, light green on the upper, and paler on the lower surface. The flowers are collected in globose or oblong heads half an inch in diameter and borne on thin pubescent peduncles which, when they first appear, are coated like the flower-buds with thick white tomentum; they are bracteolate at the apex, and are developed from the axils of lanceolate acute scarious deciduous bracts, and arranged in short racemes on the ends of the branches. The flowers are white or pale yellow, and when the stamens are fully grown are nearly half an inch long. The calyx is shortly five-lobed, puberulous on the outer surface, and about a twenty-fourth of an inch long or one quarter the length of the petals, which are puberulous on both surfaces, and, with the stamens, are persistent at the base of the fully grown fruit. The legumes, which ripen in midsummer and often remain on the branches after opening until the trees flower the following year, are straight, compressed, slightly torulose, short-stalked, contracted at the apex into a short slender point, four to six inches long and two thirds of an inch broad. Their valves are somewhat membranaceous, thick-margined, reddish brown on the outer, and yellow tinged with red on the inner surface, and reticulate-veined. The seeds are suspended transversely by slender coiled and somewhat dilated funicles, and are compressed, ovate, or nearly orbicular and a quarter of an inch long; the testa is thin, dark chestnut-brown, very lustrous, and faintly marked on the two sides of the seed with large oval depressions.

Pithecolobium brevifolium is scattered in Texas along the bluffs and on the bottom-lands of the lower Rio Grande, occurring only at a few places between Rio Grande City and the mouth of the river. In Texas it is usually a low shrub spreading into broad clumps, but occasionally, in the rich and comparatively moist soil of the river lagoons, a slender straggling tree. In Mexico, from the mouth of the Rio Grande to the Sierra Madre, it is much more common. Here it grows to its largest size and, with

the Acacia, the Parkinsonia, and the Cercidium, forms a characteristic feature of the arborescent vegetation.

The foliage is eaten by sheep and goats in winter.[1]

Pithecolobium brevifolium was discovered by Jean Louis Berlandier near the mouth of the Rio Grande in 1830.[2]

[1] Havard, *Proc. U. S. Nat. Mus.* viii. 500.

[2] The wood of *Pithecolobium brevifolium* is dark-colored, heavy, and rather hard, but I have not been able to obtain a piece large and sound enough to determine satisfactorily its specific gravity and fuel value.

EXPLANATION OF THE PLATE.

PLATE CXLVI. PITHECOLOBIUM BREVIFOLIUM.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A pistil, enlarged.
5. A fruiting branch, natural size.
6. A seed, enlarged.
7. Vertical section of a seed, enlarged.
8. An embryo, enlarged.

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[illegible] on sheep and goats in winter.[1]

P[illegible] was discovered by Jean Louis Berlandier near the mouth of the Rio Grande [illegible]

[illegible] U. S. Nat. Mus. v. iii. 440.

[illegible] is dark-colored, heavy, [illegible] and I have not been able to obtain a piece large and sound enough to determine satisfactorily its specific gravity and fuel value.

EXPLANATION OF PLATE [illegible]

PLATE CXLV. [illegible]

1. A [illegible]
2. [illegible]
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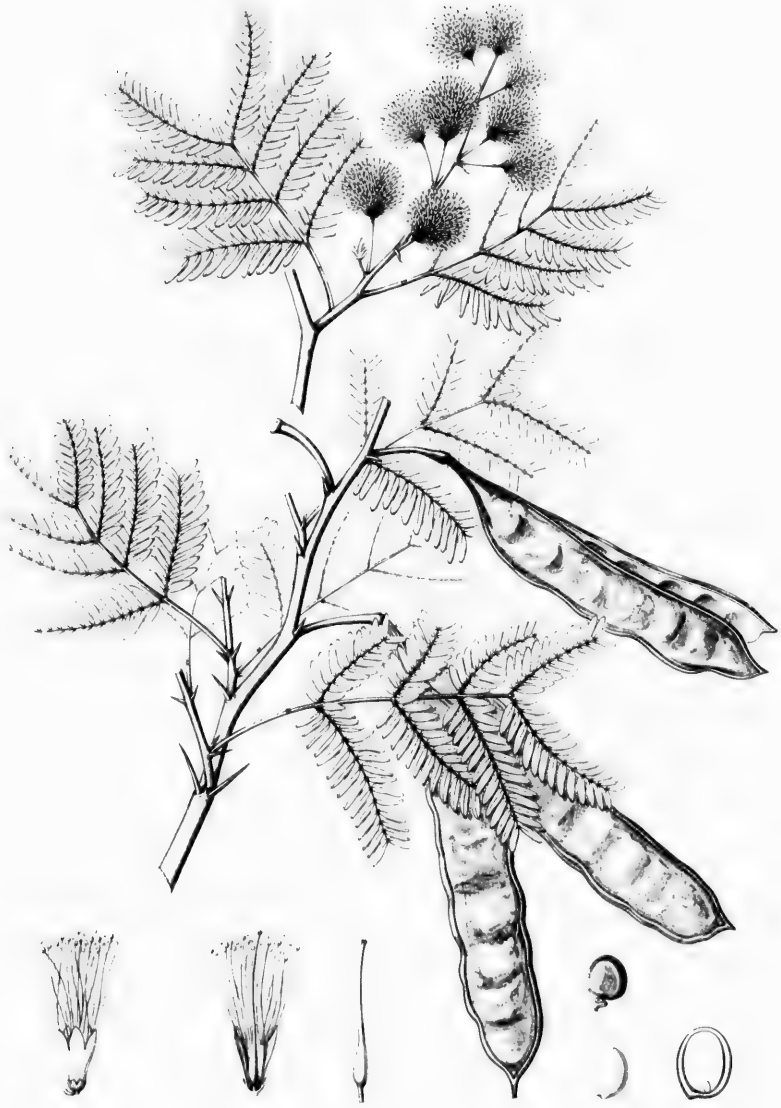

PITHECOLOBIUM FLEXICAULE.

Ebony.

FLOWERS perfect, in axillary spikes. Legume thick and woody, interrupted within. Branches armed with rigid spinescent stipules.

Pithecolobium flexicaule, Coulter, *Contrib. U. S. Nat. Herb.* ii. 101 (*Man. Pl. W. Texas*).
Pithecolobium Texense, Coulter, *Contrib. U. S. Nat. Herb.* No. 2, 37; *Bot. Gazette*, xv. 269.
Acacia flexicaulis, Bentham, *Lond. Journ. Bot.* i. 505; *Trans. Linn. Soc.* xxx. 514 (*Rev. Mim.*). — Walpers, *Rep* i. 913. — Dietrich, *Syn.* v. 497. — Gray, *Smithsonian Contrib.* iii. 65 (*Pl. Wright.* i.); *Proc. Am. Acad.* v. 158. — Torrey, *Bot. Mex. Bound. Surv.* 62. — Hemsley, *Bot. Biol. Am. Cent.* i. 353. — C. G. Pringle, *Garden and Forest*, ii. 394. — Sargent, *Garden and Forest*, ii. 400, f. 123. — Havard, *Proc. U. S. Nat. Mus.* viii. 499.

A tree, twenty to thirty feet in height, with a straight trunk two or three feet in diameter, separating, eight or ten feet from the ground, into short spreading branches which form a wide round head. The branches are stout, zigzag, covered with pale lenticels and armed with persistent stipular pale chestnut-brown spines from a quarter to half an inch in length; when they first appear they are puberulous and are sometimes light green and sometimes dark reddish brown; in their second year they are glabrous or rarely puberulous, and usually dark reddish brown or often light gray. The leaves are persistent, long-petiolate with slender puberulous petioles and rachises, with four to six pinnæ, an inch and a half to two inches long and two and a half to three inches broad. The petioles are glandular near the middle, and furnished at the apex with small orbicular solitary glands; the pinnæ are six to twelve, usually six-foliolate, the lower pair often the shortest; the leaflets are ovate-oblong, rounded at the apex, reticulate-veined, membranaceous or subcoriaceous, glabrous, dark green and lustrous on the upper surface and paler on the lower, from a quarter to a third of an inch in length, and borne on short broad petiolules. The flowers, which appear from June until August, are produced in cylindrical dense or interrupted spikes an inch and a half long on stout pubescent peduncles fascicled in the axils of the upper leaves of the previous year; they are sessile in the axils of minute caducous bracts, light yellow or cream color and deliciously fragrant, and with the exserted stamens are an eighth of an inch in length. The corolla is four or five times as long as the calyx, like this puberulous on the outer surface, and about as long as the tube formed by the union of the filaments. The ovary is glabrous and sessile. The legumes, which ripen in the autumn and remain on the branches until after the flowering season of the following year, are tardily dehiscent; they are flattened, turgid, straight or slightly falcate, sessile, oblique at the base, rounded and contracted into a short broad point at the apex, four to six inches long and an inch to an inch and a quarter broad, with thick woody valves lined with a thick pithy substance inclosing and separating the seeds. These are suspended transversely on very short straight funicles, and are half an inch in length, a quarter of an inch in breadth, irregularly obovate and usually more or less flattened on one side; the testa is thick, crustaceous, bright reddish brown, and faintly marked on the two sides of the seed with a short oblong depression.

Pithecolobium flexicaule is distributed from the shores of Matagorda Bay in Texas to the Sierra Madre in Nuevo Leon and has been found at La Paz in Lower California.[1] It is common on the bluffs of the Gulf coast in Texas and on those of both banks of the lower Rio Grande, and south of the river is one of the commonest and most beautiful trees of the region.

The wood of *Pithecolobium flexicaule* is exceedingly heavy, hard, compact, and close-grained, with

[1] Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 69.

a satiny surface, the layers of annual growth being hardly distinguishable. It is very dark rich reddish brown slightly tinged with purple, with thin clear bright yellow sapwood. The specific gravity of the absolutely dry wood is 1.0386, a cubic foot weighing 64.72 pounds.[1] It is highly prized by cabinet-makers, and for fuel is considered more valuable than the wood of any other tree of the Rio Grande valley. It is almost indestructible in contact with the ground, and is therefore largely used for fence-posts.

The seeds are palatable and nutritious if boiled when green, and are roasted when ripe by the Mexicans, who use their thick coat as a substitute for coffee.[2]

Pithecolobium flexicaule was discovered by Jean Louis Berlandier in the neighborhood of Matamoras in 1830. With the exception, perhaps, of *Leucæna pulverulenta* and of *Acacia Farnesiana*, it is the most beautiful of the Mimosa-like trees which grow naturally within the territory of the United States. It is compact in habit; its foliage is luxuriant, dark, and lustrous; the flowers, which are produced during a long period of every year, are abundant, beautiful, and fragrant, and the fruit is large and of striking appearance. *Pithecolobium flexicaule* might well be introduced into the gardens of many temperate countries, and although it grows slowly and does not attain a great size, it may prove worthy of the attention of planters as a timber-tree.

[1] *Garden and Forest*, iii. 344.

[2] Havard, *Proc. U. S. Nat. Mus.* viii. 499.

EXPLANATION OF THE PLATE.

PLATE CXLVII. PITHECOLOBIUM FLEXICAULE.

1. A flowering branch, natural size.
2. A flower, enlarged.
2ª. A flower, the calyx and corolla removed, enlarged.
3. A pistil, enlarged.
4. A fruiting branch, natural size.
5. Vertical section of a portion of a legume, natural size.
6. An embryo, natural size.
7. Vertical section of a seed, natural size.

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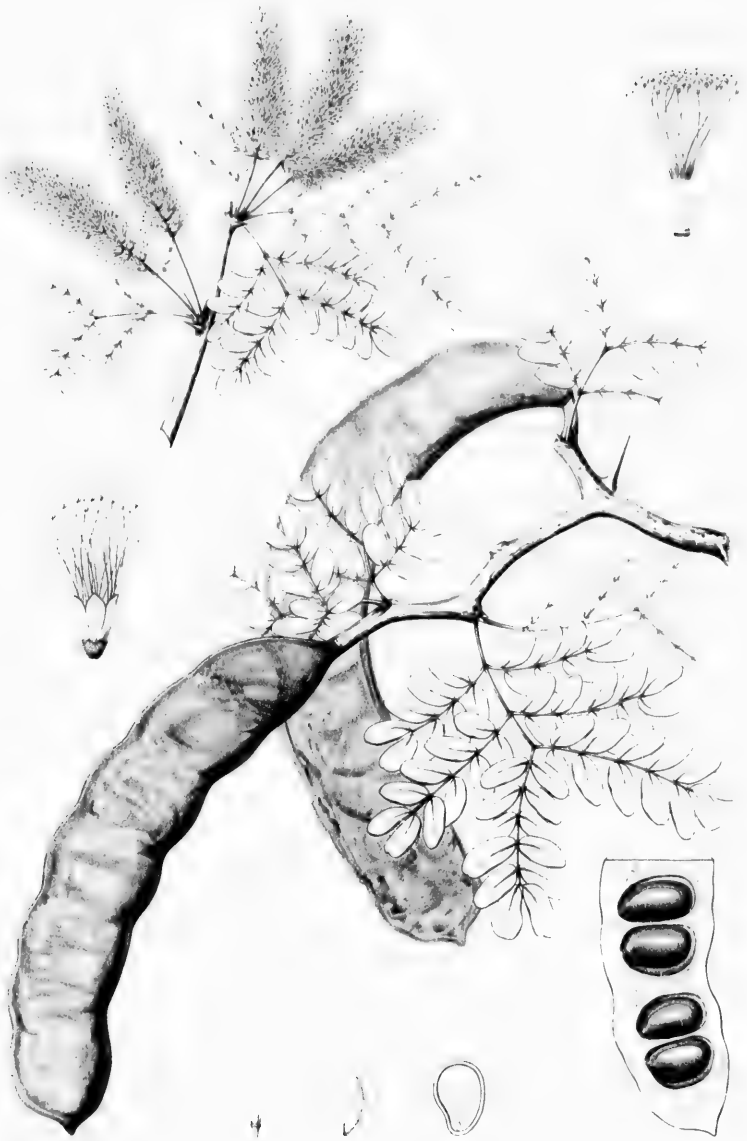

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